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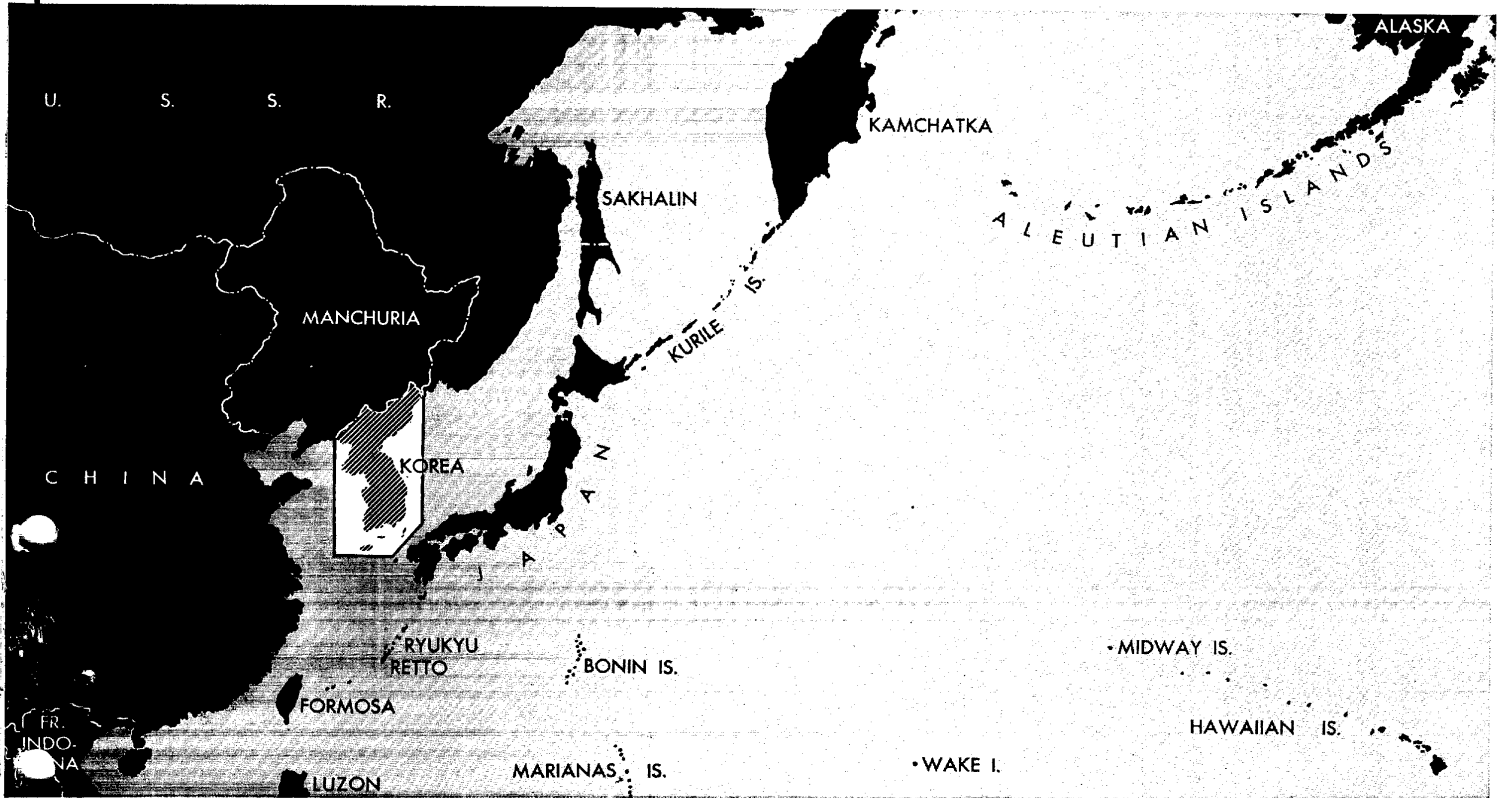
## CHAPTER II

DOCUMENT NO. 2  
NO CHANGE IN CLASS ☐  
~~DECLASSIFIED~~  
CLASS. CHANGED TO: TS S S  
NEXT REVIEW DATE:  
AUTH: MR TS-S  
DATE 14 07 80 REVIEWER:

~~Restricted~~

Non-registered

25X1



## JOINT ARMY-NAVY INTELLIGENCE STUDY

OF

# KOREA

(Including TSUSHIMA and QUELPART)

## MILITARY GEOGRAPHY

APRIL, 1945

*List of Effective Pages, Chapter II*

SUBJECT MATTER	CHANGE IN EFFECT	PAGE NUMBERS
Cover Page . . . . .	Original	unnumbered
List of Effective Pages and Table of Contents, Chapter II (inside front cover) . . . . .	Original	unnumbered
Text and Figures . . . . .	Original	pp. II - 1 to II - 58
Figures (insert, reverse sides blank) . . . . .	Original	Figures II - 79 to II - 100.
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## Chapter II

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## MILITARY GEOGRAPHY

## 20. Introduction

This chapter describes the terrain of Korea and its offlying islands, Ullung (Dagelet), Tsushima, and Cheju (Quelpart), and emphasizes the significance of terrain in relation to military operations.

Topic 21 is a general terrain description of Korea as a whole. In Topic 22 the 11 terrain regions composing the area are described individually and in greater detail. The regions are considered in clockwise order, beginning with the Lower Tuman-gang Valley in the northeast and ending with the Lower Amnok-kang Valley in the northwest. Each regional description contains a discussion of relief (including a short statement on natural routes and important areas), drainage, soil trafficability, and vegetation. Three regions, the Northern Korean Highlands, the Island Approaches, and the Western Lowlands and Hills, have been divided into subregions. Most of the regions and some of the subregions are described largely by means of detailed discussions of representative areas, maps of which are included. Topic 23 describes 6 selected areas of particular significance. These areas are Ch'ongjin, Wonsan, Pusan, Wonsan - Seoul Corridor, Seoul (Kyongsong, Keijō), and Sinuiju. Topic 24 is a short description of the most important natural routes across Korea. A more detailed description of these routes is contained in the Route Supplement to Chapters II and VII. It should be noted, however, that the route numbering in this chapter is on a regional basis, and the route numbering in the Route Supplement is on a national basis. Topic 25 is a list of principal sources.

The graphic materials included in the chapter should be used concurrently with the text. FIGURES II - 1 to II - 78, inclusive, are photographs. FIGURES II - 79 to II - 85 are insert maps of the whole area. FIGURE II - 79 is a physiographic diagram, and shows the terrain regions and natural routes described in Topic 22. FIGURE II - 80 is like FIGURE II - 79 except that routes are not shown and the relief and drainage pattern are therefore shown more clearly.\* FIGURE II - 81 is a slope map, distinguishing areas of gentle slope (generally less than 10%), moderate slope (generally 10-30%), and steep slope (generally more than 30%). FIGURE II - 82 is a hypsometric or elevation map. FIGURE II - 83 shows soil trafficability. FIGURE II - 84 is a vegetation map. FIGURE II - 85 is an index to the routes described in the Route Supplement. It is also an index map for the 6 significant areas described in Topic 23.

FIGURES II - 86 through II - 100 are detailed maps of representative parts of terrain regions described in Topic 22, or show the topography of significant areas described in Topic 24.

Considerable additional terrain information is contained in other chapters, particularly Chapter IV, Coasts and Landing Beaches. The climate of each terrain region is described in Topic 52 of Chapter V, Climate and Weather.

A regional summary table of relief, drainage, vegetation, soil trafficability, and climate is included in PLAN 3. A brief

summary of Chapter II is included as Topic 2, Military Geography, in Chapter I, Brief. PLANS 4, 5 to 34, and 48 to 51, together with ROUTE SUPPLEMENT FIGURES RS-5, RS-6, RS-11, RS-13, RS-16, RS-19, RS-20, and RS-21, comprise a medium-scale (mostly 1:250,000) topographic map of the entire area.

## 21. General Description

The basic maps for concurrent use with this topic are FIGURES II - 79 to II - 84.

## A. Relief.

Korea is a mountainous, S-shaped peninsula extending southward from Manchuria and Siberia toward Kyūshū (FIGURES II - 79 to II - 83). From its northeastern border along the Tuman-gang due south to Pusan, Korea extends about 525 miles. Its width east - west varies from 125 to 200 miles, and its area is estimated at 85,000 square miles. The Korea Strait, which separates the peninsula from the main islands of Japan, is some 125 miles wide. Most of the northern boundary of Korea is formed by the deeply entrenched and winding Amnok (Yalu) and Tuman Rivers. Manchuria touches all this boundary except the easternmost 10 miles of the Tuman-gang where the Maritime Province of Siberia has a common boundary with Korea.

Several large islands and hundreds of small islands lie off the peninsula. About 80 miles off the southeast coast is Ullung-do, a rugged, shield-shaped island. The 2 islands of Tsushima are about half way between Korea and Kyūshū. The island of Cheju (Quelpart Island) lies 50 miles off the southwest corner of the peninsula. Hundreds of steep, rugged, but small islands lie off the south and west coasts.

The east coast of Korea faces the Sea of Japan and is mostly steep and rugged, with small pocket lowlands separated by hills or mountainous promontories. The south coast faces the Korea Strait. This coast is deeply indented and very irregular. Swift tidal currents and a very great tidal range make navigation dangerous among the islands off shore. The west coast faces the Yellow Sea. It is mostly low, is greatly indented and has swift tidal currents. At low tide a 1- to 5-mile-wide belt of mud flats is exposed.

The relief pattern of Korea is dominated by the following highland elements: (1) A large mountain mass in the north and northeast, (2) A long, nearly continuous mountain barrier extending southward from these northern highlands, and bordering the full length of the east coast, (3) Several tributary ranges and spurs extending southwestward from the main east coast range.

Only a small part of Korea is lowland (FIGURE II - 82). These lowlands are similar to each other in many respects, but vary in size and have special characteristics depending upon position. They are found in 5 general locations on the peninsula: (1) along the lower Tuman-gang and Amnok-kang Valleys in the north, (2) forming a series of small, discon-

\* A photograph of a relief model of Korea is included in Chapter I, Brief.

nected pocket lowlands along the east coast, (3) in the Nakdong-gang Basin, inland from Pusan, (4) in a discontinuous belt along the south coast, (5) forming a series of 5 large and important lowlands along the western side of the peninsula. Each of the western lowlands is separated from its neighbor by a zone of mountains, hills, or ridges.

The mountain framework, because of its location and alignment, tends to restrict movement in any direction. The Northern Korean Highlands and the long, north-south-trending Taebaek Ranges make east-west, cross-peninsular, large-scale movement virtually impossible. The only significant east-west passageway extends between Wonsan and Seoul (Kyongsong, Keijō), but even this is locally narrow and steep (FIGURE II-81). The tributary spurs, of which the Sobaek Range extending southwestward from the Taebaek Ranges is the most important, present a series of potential natural defensive positions at intervals of 10 to 30 miles across lines of north-south movement on the western side of Korea. Similarly, the steep ridges or hills separating successive small pocket lowlands at intervals of 1 to 6 miles along the east coast constitute a series of natural defensive positions across a line of north-south movement there. The winding rivers of western Korea, when at flood, also form obstacles to north-south movement. Such rivers as the Kum, the Han, the Imjin, the Yesong, the Taedong, and the Ch'ongch'on have channels 200 to 2,000 yards wide (FIGURE II-80).

#### (1) Regional delineation.

The terrain regions referred to in subsequent paragraphs are shown in FIGURES II-79 to II-82, and II-84. The regions and subregions are:

1. Region 1. Lower Tuman-gang Valley.
2. Region 2. Eastern Coast Lowlands and Hills.
3. Region 3. Northern Korean Highlands.
  - Subregion 3a. Eastern Hills and Mountains.
  - Subregion 3b. Kaima Plateau.
  - Subregion 3c. Yangnim Range.
  - Subregion 3d. P'yongan-pukto Hills and Mountains.
4. Region 4. Northern Taebaek Range.
5. Region 5. Wonsan-Seoul Corridor.
6. Region 6. Southern Taebaek Range and Sobaek Range.
7. Region 7. Nakdong-gang Basin and Hills.
8. Region 8. Southern Coast Lowlands, Hills, and Islands.
9. Region 9. Island Approaches.
  - Subregion 9a. Ullung-do.
  - Subregion 9b. Tsushima.
  - Subregion 9c. Cheju-do.
10. Region 10. Western Lowlands and Hills.
  - Subregion 10a. Cholla-namdo and Cholla-pukto Hills.
  - Subregion 10b. Kum-gang Basin and Valley.
  - Subregion 10c. Ch'ungch'ong-namdo and Ch'ungch'ong-pukto Hills.
  - Subregion 10d. Han-gang Basin and Valleys.
  - Subregion 10e. Kyonggi-do Hills.
  - Subregion 10f. Imjin-gang and Yesong-gang Valleys.
  - Subregion 10g. Hwanghae-do Hills.
  - Subregion 10h. Taedong-gang Valley.
  - Subregion 10i. P'yongan-namdo Hills.
  - Subregion 10j. Ch'ongch'on-gang Valley.
  - Subregion 10k. P'yongan-pukto Hills.
11. Region 11. Lower Amnok-kang Valley.

#### (2) Mountains and hills (FIGURE II-82).

The 3 major highland regions of Korea are (a) the northern mountain ranges; (b) the ranges of the peninsula including

the Northern Taebaek Range, the Southern Taebaek Range, and its appendage, the Sobaek Range; and (c) the lower, hilly spurs, which extend southwestward from the main mountain systems. These hilly spurs separate the various basins and valleys of the southern and western coast.

(a) *Northern mountain ranges.* These mountains compose the Northern Korean Highlands (Region 3) and are a continuation of the mountains of southern Manchuria. Their drainage is mostly northward toward the Amnok and the Tuman, whose deeply entrenched and sinuous valleys form the greater part of the boundary with Manchuria. The highlands are largely rugged, steep, and rocky, but include areas of gently sloping upland, at elevations of 4,500 to 6,500 feet. These uplands, comprising the Kaima Plateau, are a conspicuous feature of the area southeast of Paektu-san. Although the undulating upper surfaces of the Kaima Plateau are favorable for movement, they are set apart by steep valley sides and are practically isolated. Except for these flattish uplands the Kaima Plateau is very unfavorable for movement. The easternmost and westernmost parts of the Northern Korean Highlands have rolling to steep hills and mountains, generally 1,000 to 3,000 feet high, with winding, U-shaped valleys as much as a mile wide. Passes on principal routes are 1,600 to 2,300 feet high. These eastern and western extremities are generally more favorable for movement than the very broken Kaima Plateau and the very rugged Yangnim Range which lie between them. The Yangnim Range is the highest and most inaccessible portion of the Northern Korean Highlands Region. Summit elevations range from 5,000 to more than 8,000 feet; almost all slopes are steep; valleys are narrow and very winding. Passes on principal routes are 3,500 feet or more in elevation.

In general, the terrain in the Northern Korean Highlands is unfavorable for movement. The winding valleys offer only limited possibilities for movement and the hills and mountains are very difficult. Natural routes are largely concentrated in the eastern and western parts of the region.

(b) *Peninsular highlands.* The peninsular ranges include the Northern Taebaek and the Southern Taebaek with its largest appendage, the Sobaek Range. The Northern Taebaek Range is a southward extension of the Northern Korean Highlands. Here the ridges trend mostly north-south, but the valleys extend in all directions. The region is rugged, partly forested and well drained, but unfavorable for cross-country movement. The hills and ridges are generally 1,500 to 5,000 feet high, and are steep. Valleys are narrow, gorge-like, and extremely winding. In their upper reaches the larger westward-flowing rivers, such as the Ch'ongch'on, the Taedong, the Yesong, and the Imjin, flow in narrow, steep-sided valleys or gorges which provide no room for extensive movement or deployment. The hill and mountain slopes are very unfavorable to cross-country movement. No routes suitable for rapid, large-scale movement cross this region in any direction. Existing roads are narrow and winding, and cross steep passes 2,000 to 3,600 feet high. Separating the North and South Taebaek Ranges is the Wonsan-Seoul Corridor, the most favorable passage between the east and west coasts.

South of the corridor is the Southern Taebaek Range. This is a continuation of the Northern Taebaek Range and is similar in character—steep and rugged, with narrow, winding,

gorge-like valleys. Summit elevations are generally 2,000 to 5,000 feet. Most of the ridges and valleys are aligned north - south, although the region as a whole trends northwest - southeast.

The Sobaek Range is a southwestward extension of the Southern Taebaek Range. It lies across the routes from Pusan to Seoul. Terrain at higher elevations in the Sobaek is rugged, like that of the Taebaek, but the average elevation is lower (2,500 feet) and a greater area has moderate slopes. The river valleys are wider, particularly in their lower reaches, but there is little flat land in the Taebaek or in the Sobaek; nearly all the surface is sloping. The small areas of flat land in the valleys are irregular in size and shape and are discontinuous.

In general, the highland terrain of the peninsula is unsuitable for cross-country movement. Steep, eroded slopes, and nontrafficable soils resulting from heavy summer rains, are unfavorable factors for movement in the lower hills. In the higher areas, cliffs, very steep slopes, and rugged terrain resulting from extensive erosion make cross-country operations almost impossible. Even on the flat valley floors, movement is hampered by the winding character of the streams, by floods, and by wet rice fields.

All east - west routes across the Southern Taebaek are steep, narrow, winding, and cross passes at least 1,200 feet high. These routes probably are unsuitable for heavy, two-way traffic. Three of the main north - south routes of Korea cross the Sobaek Range. All three are locally narrow and winding, and cross passes 330 to 1,600 feet high.

(c) *Hill country.* The southwestward-trending hilly spurs extending from the main mountains toward the south and west coasts separate the various southern and western lowlands, and are discussed below.

### (3) Lowlands (FIGURE II - 82).

Korea's lowlands are relatively small and most of them are nearly surrounded by hills and mountains. The largest and most productive of them are found in the west and south, and are associated with the larger rivers, such as the Taedong, the Han, the Kum, and the Nakdong. Each lowland is flat or gently sloping, intensively cultivated, and drained by a main stream and smaller tributaries. Many lowlands are protected from flood waters by dikes. The largest lowlands are 25 to 30 miles wide and may extend 30 to 50 miles inland; the smallest are about a mile wide and extend 3 to 5 miles inland.

(a) *Northern border lowlands.* Both the Lower Tuman Valley (Region 1) on the northeastern border, and the Lower Amnok-kang Valley (Region 11) on the northwestern border are winding, entrenched, steep-sided, and flanked by hills and mountains. Neither lowland provides continuously favorable terrain for movement inland. Existing routes are successively close to the rivers and several miles away, among the hills. These regions have military importance because of their situation along the Siberian and Manchurian borders.

(b) *Eastern coastal lowlands.* The Eastern Coast Lowlands and Hills (Region 2) includes a series of semi-isolated pockets near the mouths of streams. These lowlands are generally flat, intensively cultivated, 1 to 6 miles broad, and extend 3 to 8 miles inland. Along the shore they generally have a cobbly beach, backed by dunes or a lagoon. On the land side they are surrounded by steep, partly forested hills or moun-

tains. Each lowland pocket narrows inland into a winding, steep-sided valley. The largest and most important of these is between Hamhung and Wonsan and leads inland to the Wonsan-Seoul Corridor.

(c) *Southern interior lowlands.* The Nakdong-gang Basin (Region 7) in the southeastern part of Korea, contains an extensive area of lowland. This lowland borders both sides of the Nakdong-gang and of its major tributaries, and varies in width from a few yards to 8 to 10 miles. It provides a low but very winding route 125 miles into the peninsula from the Nakdong delta near Pusan. Dikes and levees up to 15 to 20 feet high protect the cultivated parts of the valley from flood waters. The uncultivated parts are covered with sand, cobbles, or boulders and are nearly bare of vegetation. The cultivated parts produce a variety of crops, chiefly rice. Rolling, much eroded hills overlook all of this lowland. Above the hills, steep mountains, 3,000 to 4,000 feet high, rise as conspicuous landmarks. Lowland terrain conditions favor cross-country movement except on the wet rice fields and during wet summer weather. Existing routes are not steep, but are very winding. The principal Pusan-Seoul road and rail routes cross the region.

(d) *Southern coastal lowlands.* The Southern Coast Lowlands, Hills, and Islands (Region 8) includes several small lowlands, most of which are situated at the heads of bays. These lowlands trend mostly north - south, occupying the valleys of the Somjin-gang and smaller streams to the east and west. They are 1 to 5 miles wide and 3 to 8 miles long. Numerous small, flat lowland areas are planted almost entirely to rice, but some low areas are barren river flood plains, or are planted to dry crops.

Low, steep, gullied hills separate the numerous small lowland areas. On the south, winding, rugged peninsulas enclose the bays, and hundreds of rugged islands dot the bays and guard the coast to a distance of 50 miles offshore. On the north, west, and east, steep, gullied hills and mountains surround the lowlands and confine the routes between them. Some of the larger bays at whose heads the lowlands begin are Chinhae-man, Kwangyang-man, and Tungnyang-man. Among the largest islands offshore are Koje-do, off Chinhae-man (Masan); Namhae-do, near Kwangyang-man (Yosu); and Chin-do, near Mokp'o. The most favorable areas for cross-country movement are those lowlands which are not in rice, and the lower hills. The rice paddies are unfavorable for movement when wet, and most of the hills are gullied and steep. Existing road and rail routes lead mostly northward toward Seoul. The roadways are not steep but are very winding. The east - west, coastal road follows a devious route, skirting the shore, turning inland to avoid hills, crossing some lowlands but avoiding rice fields, and crossing passes less than 1,000 feet high.

(e) *Western lowlands.* The 5 major lowlands in the Western Lowlands and Hills (Region 10) are the most extensive in Korea. They trend mostly northeast - southwest. The largest are 25 to 30 miles wide and extend 30 to 50 miles inland. Rolling and steep hills and ridges separate the various lowlands from each other and constitute potential natural defensive positions blocking north - south movement. The lower, broader coastal basin sections of the lowlands are mostly bordered by hills even on the sea side, and generally have restricted outlets to the coast. The slightly higher, nar-

rower, winding, valley sections of the lowlands are overlooked on both sides by eroded hills and ridges which extend inland to the major ranges. The chief westward-flowing rivers, such as the Kum, Han, Imjin, Yesong, Taedong, and Ch'ongch'on, also form natural barriers across lines of north - south movement.

From south to north, the lowlands have been designated according to the principal rivers, the Kum, the Han, the combined Imjin and Yesong, the Taedong, and the Ch'ongch'on. The hills and ridges separating the lowlands have been named according to the provinces where these hills are principally located. The lowlands have the following characteristics: (1) They are moderately to extremely winding, and are drained by very sinuous streams. (2) Near the sea they become flatter and broader (10 to 30 miles) with extensive rice cultivation, canals, and ditches. (3) The principal rivers empty into estuaries 1 to 4 miles wide, where, at low tide, 1 to 5 miles of slimy mud flats are exposed. (4) The river banks are alternately steep and gentle. The lower hills are locally terraced and cultivated; the steeper and higher hills are gullied by erosion, and are partly covered with grass, scrub pine, and scattered trees. (5) The lowland areas are intensively cultivated. Rice is the principal crop and is grown chiefly in the lower parts. Dikes, some of which are 15 to 20 feet high, protect the cultivated fields from flood waters. (6) Hills or ridges overlook every part of these lowlands. Concealment is generally lacking in the lowlands as well as in the hills. (7) The most favorable routes for cross-country movement on these lowlands are in or near the low, rolling hill sections. These routes are very winding, but have few bottlenecks, and generally have ample room for deployment.

The principal north - south road and rail routes and important east - west routes join in the Han Valley at Seoul, which is the transportation hub of the peninsula. From this place road and rail routes go northeast to Wonsan, southeast to Pusan, south to Taejon, west to Inch'on, and northwest to P'yongyang and Sinuiju. Taejon, in the Kum Valley, and P'yongyang, in the Taedong Valley, are also situated at road and rail junctions. From each of these cities routes lead north - south and east - west.

(f) *Wonsan - Seoul Corridor.* The Wonsan - Seoul Corridor trends nearly north - south through the east coast mountains and separates the Northern Taebaek Range from the Southern Taebaek Range. It is followed by a road and rail route about 60 miles long. Near the northern and southern ends of the corridor, the rail route follows gently sloping valleys a mile or more in width. The middle 12 miles of the rail route is in a narrow gorge or depression. Highest elevations on the rail route are about 2,000 feet. The road route is longer and has a maximum elevation of about 2,300 feet. The northern and southern parts of the road route are similar to the rail route, but the middle 30 miles goes through alternately wide and narrow stream valleys, bordered by steep hills. Both routes have a steep portion a mile or two long. Although the corridor is not entirely suitable for rapid, large-scale movement, it offers less difficulty than other east - west routes.

## B. Drainage and water supply.

(FIGURE II - 80).

Korea is well watered and well drained. It has an intricate

drainage network but relatively few lakes. Marshes are small and of only local significance except in coastal tidal areas.

### (1) Rivers.

There are nine principal river systems, each of which drains an extensive area.

(a) *Major rivers.* The Tuman-gang is the only major eastward-flowing stream of Korea. It drains most of northeastern Korea and flows into the Sea of Japan. Its lower course is navigable by lighter craft for about 50 miles. The lowest 10 miles of its course separates the Maritime Province of Siberia from Korea. Its upper section forms part of the boundary between Korea and Manchuria.

The Nakdong-gang and the Somjin-gang flow southward and are the principal rivers in southern Korea. The Nakdong-gang is navigable by light craft for about 200 miles.

On the west side of the Korean Peninsula are the Yongsang-gang, Kum-gang, Han-gang, Taedong-gang and the Ch'ongch'on-gang systems, all of which drain into the Yellow Sea. These streams are comparatively long, very sinuous, and have extensive tidal flats at their mouths.

In the northwest, the Amnok-kang forms part of the boundary between Manchuria and Korea and flows southwestward into the Yellow Sea. The Amnok-kang is 500 miles long and is Korea's longest river. It and its tributaries have cut deeply entrenched, narrow, winding valleys with relatively flat bottoms. Its main channel is encumbered by many islands and sand banks in the lower course and by numerous upstream rapids. The river is navigable by small, light craft, such as motor boats, for about 350 miles up from its mouth.

(b) *River characteristics.* Except for the Amnok, Korean rivers are short (100 to 350 miles). Generally, they are swift in their upper courses, slow in their middle reaches, and excepting those along the eastern coast, have built up fairly large flood plains. With minor exceptions the pattern of drainage trends with the relief of the peninsula. A common characteristic is the very large amount of debris carried by the east coast streams and in the upper reaches of all streams. This results in boulder-filled channels in the swift sections and sediment-loaded water throughout. Few of the rivers could be used as waterways but their valleys are important as routes for movement.

The main rivers range in width from 4 miles (at the mouth of the Amnok-kang) to about 50 yards (in the narrow gorges of the upper Tuman-gang). Normally, most of the major rivers are  $\frac{1}{4}$  to  $\frac{1}{2}$  mile wide at many points. Many smaller streams range between 100 and 200 yards in width.

Most Korean streams are relatively shallow. Many of the river courses are fordable during low-water season (November to March). Their average normal depth is 2 to 3 feet in their upper reaches and about 6 to 9 feet in their lower courses. During high-water season many of the streams become raging torrents, and flash floods occur. The amount of debris transported is enormous; the rivers raise their stream beds and flood the valley bottoms downstream. At such times flood waters 5 to 15 feet deep may inundate the rice fields. During high-water season the rivers would be a major barrier to movement.

In their lower courses, especially near the west and south coasts, the streams have low banks. The banks of the lower Nakdong-gang and of the streams along the west coast are

10 to 15 feet high. Many of the upper courses of the streams flow through narrow valleys with cliffs 30 to 50 or more feet high. Numerous rock gorges of the upper Amnok-kang and Tuman-gang (and of the short streams along the east coast) are more than 100 feet deep. Generally, the river banks of the lowland areas are of sand and gravel and are gradual in slope. Many of the banks have long barren stretches interrupted by patches of grass and thickets. Along many of the stream banks are large boulders and rocks moved downstream during high water.

The rivers in northern Korea are frozen from 3 to 4 months annually. Those in the central sections of the peninsula are frozen from 2 to 3 months. During winter many of the streams and irrigation canals in the Western Lowlands are frozen and can be crossed by foot troops. The rivers and streams of southern Korea, however, are open all year.

### (2) *Lakes and marshes.*

There are no large lakes or ponds in the peninsula. Two large reservoirs have been constructed in the Northern Korean Highlands, and the very large Sup'ung Reservoir is in the Amnok Valley. There are many small ponds and lagoons scattered along the east coast, but these are mainly of only local significance. Small marsh areas are numerous locally, especially along the tidal river mouths of the west and south coasts. Generally, they can be by-passed and are only minor barriers to movement.

### (3) *Water supply.*

Korea has a plentiful supply of water in most sections of the peninsula. It is not safe for consumption and should be treated before use. The water table is high along the coast most of the year and much of the water tastes salty. Many of the larger cities have water supply systems but usually the villages and countryside obtain their supply from wells. Owing to the lack of vegetative cover, and to mountainous terrain, run off is rapid. The amount of water available fluctuates seasonally. Fall and winter are the dry periods.

## C. General soil trafficability.

(FIGURE II-83).

Soil trafficability is the capacity of soils to support vehicles moving cross country, or moving on unimproved roads or trails. Soil trafficability is determined by the type of soil (textural grade, organic matter content, and other profile features), by topography, by vegetation, and by weather factors. In this area the important weather factors are precipitation (duration, intensity, and character); temperature (as it affects evaporation, plant growth, and the freezing and thawing of soil); and wind, cloud cover, and humidity, which affect evaporation of soil moisture.

### (1) *Terrain and soil trafficability.*

By far the greater part of Korea is rough or mountainous and therefore unfavorable for cross-country movement of wheeled vehicles, regardless of soil or weather conditions. Where topography is favorable in valley and coastal lowlands, much of the land is planted to wet rice. Rice paddy lands are particularly numerous in southwestern Korea where great irrigation projects have extended a complicated network of canals over the valley and coastal plains. The paddy lands are flooded

and nontrafficable from early June until the harvest during October or early November. After the harvest most of the paddy fields north of 37°N are fallow, but canals (which in many places are raised above the general level of the fields) and irrigation ditches remain serious obstacles to cross-country movement. South of 37°N, winter crops are raised in some fields on ridges about 1 foot high and 2 feet wide, spaced about 2½ feet apart; these ridges are additional obstacles to cross-country movement. The areas in which mountain lands and lowland rice paddy land predominate are shown on the soil trafficability map (FIGURE II-83).

In nonpaddy areas of favorable topography, soil drainage characteristics and weather factors are particularly important in determining the feasibility, route, and rate of cross-country vehicular movement. In such areas medium-textured soils (loams), many of which are stony or gravelly, are the most common textural type. Where these soils occur on valley terraces or hill slopes, they remain trafficable during non-persistent light or medium rains. During heavy or persistent rains, however, they become slippery and muddy and may mire vehicles locally. Their normal trafficability is regained rapidly after periods of rain. Loams occurring in lowland areas will mire vehicles almost everywhere during heavy or persistent rains, dry rather slowly, and are locally subject to flooding by stream overflow.

Fine-textured soils (clay loams and clays) also have widespread distribution in valley lowlands, on terraces and low hill slopes. The clay soils are slippery and muddy when wet, and, other factors being equal, they require a longer period than do loams to regain trafficability after periods of rain. In northernmost Korea, the clays are frequently peaty types which hold moisture and afford poor trafficability except when deeply frozen.

Coarse-textured (sandy and gravelly) soils afford the most favorable all-weather trafficability conditions. Where these soils occur on beaches or narrow coastal strips, they are trafficable at most places regardless of weather conditions. The tides along the western and southern coasts range up to 30 feet and extensive coastal flats are exposed at low tide. Where these flats are sandy, they may support light traffic, but trafficability deteriorates rapidly with continuous passage of vehicles. The coarse-textured soils in inland areas are trafficable at most places except during heavy rains or following persistent rainy periods. They are subject to local flooding in stream valleys.

The soil trafficability map (FIGURE II-83) indicates in as much detail as is possible on such a small scale, the areas where the different soil types predominate. The legend is self-explanatory insofar as it indicates the relative trafficability of the different soil types in their natural state. Caution is urged in the use of the map, however, as it shows general regional contrasts only, rather than detailed information for any one place.

### (2) *Weather and soil trafficability.*

In Korea as a whole, the most favorable period for the cross country movement of wheeled vehicles is during late September, October, and early November. During this period, precipitation is generally light and infrequent at most places, and paddy lands are drained for harvest. Precipitation is further decreased, both in amount and frequency, for the period from late November through February, but there are important

regional contrasts in trafficability. In coastal lowland areas south of 37°N, where a snow cover seldom persists, general trafficability may be better during winter than during the fall. Shallow soil freezing may occur for a few days at a time but the periods of thaw which follow do not seriously reduce trafficability.

Northward from 37°N, winter trafficability for wheeled vehicles becomes less favorable because of a more persistent snow cover. There are few data on the depth of snow, but, in coastal regions, it probably seldom exceeds a foot on level lowlands. In northwestern Korea, several feet of snow are common in drifts in inland valleys and on westward slopes. Soil freezing is usually persistent from December through February in inland areas north of 37°N, and is probably deep enough to aid vehicular movement where the snow cover is light or absent. In coastal areas soil freezing is less persistent, and periods of surface thaw cause poor trafficability during the winter. Most streams and rivers north of 38°N freeze over during late November or December in a normal year, and the ice will probably support vehicles of light and medium weight at most places during January and February.

During March and April the soil is often saturated, and trafficability is generally poor. Soil moisture provided by melting snows and thawing soil drains slowly, because of the disruption of normal soil drainage channels by the winter freezing. Stream ice also breaks up at this time. Trafficability conditions are much more favorable in southern Korea than in northern Korea during this period.

During May and early June rains are frequent but light at most places; although the lowland soils and clay soils are frequently slippery and muddy, the soils with better drainage properties are usually trafficable.

During the period from late June through early September, heavy and persistent rains produce periods of widespread poor trafficability. A large proportion of the annual precipitation falls during this period which is the least favorable, for the area as a whole, for cross-country movement of wheeled vehicles.

#### D. Vegetation.

(FIGURE II - 84).

The most significant features of Korea's vegetation pattern are the treeless, grass-clad hills and mountains which are found almost everywhere throughout the peninsula. Low scrub pine is scattered over mountain slopes. Cultivated areas are concentrated in the valleys. Some small local areas have been reforested. Only in sections of the Northern Korean Highlands and within large monastery domains in the Southern Taebaek Range, has the forest been little disturbed. There, large native forests remain. These original forests are the exceptions, for in more than 3/4 of the whole country the natural tree growth has been destroyed. Where no cultivation is attempted and in crop areas that have been abandoned, coarse grasses, shrubs, and scrub pine dominate. Wood is the chief fuel in Korea; the trees and shrubs are hacked and maimed annually to supply wood for this purpose. As a result, the forests are most seriously depleted in areas of the most dense population. Tree types are similar to those of the New England States. Such trees as pine, fir, spruce, oak, birch, and maple are most common.

There are 5 major vegetation types in Korea. These are (1) the mixed deciduous broadleaf and coniferous forest, (2) deciduous broadleaf forest, (3) cultivated areas, (4) barren sections, and (5) marsh lands. Grasslands are associated with all types.

##### (1) *Mixed deciduous broadleaf and coniferous forest.*

The mixed forest includes almost 3/4 of the forested area of Korea. Pine and fir are the two most common coniferous trees in this forest. Red pine grows in all parts of Korea except on the highest mountains and in the cold northern interior. Oak and birch are the common broadleaf trees. Most of the mixed forest has been cut over at least once, and the present trees are secondary or tertiary growth. Much is bush forest of low quality. In the Yangnim Mountains of the Northern Korean Highlands, and in the Southern Taebaek Range some red pines are 75 feet tall and 3 to 4 feet in diameter. In the mixed forest, flat-leaf spruce, Korean fir, and nut pine may be from 80 to 120 feet tall and from 3 to 5 feet thick. Oaks and birches are sometimes 50 to 60 feet tall and from 2 to 3 feet in diameter. Within the repeatedly cut-over sections of the region, these trees are much smaller. In some mountain sections a gradual transition from mixed forest to pure coniferous forest occurs, usually at between 4,000 to 5,000 feet elevation. Coniferous forests predominate on the northern slopes of Cheju-do, and on other high mountains. There are few mountains that extend above the tree limit. The important exception is Paektusan. The trees are low and deformed near the upper limit of tree growth. In the mixed forests of the north, tree growth ceases at an elevation of about 6,000 feet. In the extreme southwestern part of the peninsula and on Cheju-do there is, below the mixed forest zone, a narrow strip of broadleaf evergreen forest including bamboo.

Generally, the undergrowth in the mixed forests is only moderately dense. It varies with the stage of forest development in any given locality. In the secondary forest of pine, fir, oaks and maples on the plateau of the Kanan-san (Region 4: Northern Taebaek Range) at an elevation of 4,800 feet, the forest is so thick that it may require 1 1/2 hours to go 1,500 feet. In older forests, there is an abundance of tree trunks and low limbs covered with vines. Such a forest surrounds Paektusan for a considerable distance. Generally, passability increases with altitude. The coniferous forests of red pine are easier to penetrate than the mixed forest at lower elevations. The extensive larch forests of northeastern Korea are relatively clear of underbrush. (Larch is a deciduous conifer.)

The summits of higher mountains are covered with alpine shrubs, such as creeping pine, dwarf juniper, and dwarf willow in great variety.

##### (2) *Broadleaf forest (FIGURE II - 84).*

Broadleaf forests are most extensive in the northwestern part of the peninsula. Smaller areas parallel the northeast coast and are scattered throughout the Northern and the Southern Taebaek Ranges. Oak, birch, maple, aspen, willow, poplar, and elm are the most common broadleaf trees. Among the largest ones in the natural forest are the Mongolian Oak which may be about 60 feet tall, and 2 to 3 feet thick. A common species of birch sometimes grows to about the same size. The small-leaf elm may develop to about 75 feet in height and 3 to 5 feet in thickness. Forests of these trees are most common on steep,

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rocky mountains unsuited to agriculture, where the soil is poor and there is little settlement nearby. In general, broadleaf trees of Korea are not large when compared with similar species in forests in America, Europe or Japan. In contrast to the mixed forests, the broadleaf forests have a dense undergrowth. Shrubs and vines grow in abundance. Flowering species include azalea, rose, magnolia, honeysuckle, lilac, forsythia, and spiraea.

### (3) *Cultivated areas.*

Approximately 20 percent of the 85,000 square mile area of Korea is cultivated. Korea is a land of varied climate, and correspondingly varied crops and crop practices. In winter the fields of southern Korea are green with barley or other grains while snow lies deep in the northern interior.

The cultivated areas have their largest extent in the Western Lowlands and Hills (Region 10), but the entire peninsula is intensively cultivated wherever possible. In all the more accessible valleys, slopes, and plateaus the most fertile soils have been brought under cultivation. Paddy rice is by far the principal crop and occupies  $\frac{1}{3}$  of all the cultivated land. Other crops, in addition to various small grains, include soy beans, potatoes, corn, grain sorghum, cotton, fruits, low growing vegetables, and ginseng. From North P'yongan to South Cholla Provinces, the populous centers are in the wide, intensively cultivated valleys. In the lower mountain regions, patchy agriculture of wheat, millet, and barley predominates, and even in a few of the mountain valleys rice cultivation is attempted.

Cultivation in Korea is divided into two essentially different types approximately along the 37th parallel of north latitude. To the south, winter crops are grown on the rice fields. To the north, there is no double cropping. Depending on the region and locality, rice is generally planted in seed beds in April and transplanted into the fields in early June. Harvesting occurs during October. In the south, where fields are used for double cropping, the rice fields are replanted in October to another crop, such as beans or grain, which is harvested usually in June, and the field is then replanted with rice. Fields where double cropping does not occur remain idle during the winter season. There is more irrigation in the south than elsewhere.

Much of the cultivation in the mountainous regions is characterized by cultivated lands cleared by fire, called *kaden* (literally fire fields). Permanently cultivated fire fields extend up to elevations of 4,000 to 5,000 feet and are found even on steep slopes. They are most extensive in the Northern Korean Highlands and on the forested slopes of mountains marginal to lowlands. The burned-over areas are rectangular in shape. Generally, more forest burns than is needed. Stumps are left standing and are from 3 to 9 feet high. These tree stumps and tree trunks lie between the rows of cultivated plants. In winter the fire-cleared fields stand out as white spots on a gray background; in spring, brown on a green background. In the summer and fall the colors of the field will depend on the crop and stage of advancement, bright green, greenish-white, yellow, yellowish-brown, or wine-red. After a few years the field is abandoned and becomes covered with grass, bushes, and weeds. If the soil has not been eroded too much, a poor growth of secondary forest may cover the field.

### (4) *Barren sections.*

Areas lacking a vegetative cover are found throughout Korea, particularly in the Western Lowlands and

Hills (Region 10) and in the Naktong Basin and Hills (Region 7). These barren areas are scattered along the valley flood plains, often interrupted only by patches of grass. In places, the barren sections may extend along the rivers for several miles. In other areas they are small, and intermingled with scattered trees or irregular cultivated fields. There are also numerous barren rock ledges and outcrops along the steep and narrow valley sides and on the steep mountain slopes.

### (5) *Marshlands.*

There are many marsh and swamp areas throughout the peninsula. They are most numerous near the tidal river mouths along the west and south coasts, but do not include the extensive tidal flats of the west coast. Small in extent, they could usually be by-passed. Two of the largest marsh areas are near the Pujon and Changjin Reservoirs in the North Korean Highlands (Region 3).

### (6) *Effect of vegetation on operations.*

In general, relief interposes much greater hindrances to movement than does vegetation. In forested areas, the foliage usually offers good concealment. Numerous sections of the peninsula can be penetrated without encountering dense underbrush. *Kaden*, or fire fields, numerous stumps and high tree trunks offer partial concealment for small groups of men. In cultivated areas, most crops are low growing, and excepting the wet rice fields, in western and southern Korea offer no hindrance to cross-country movement. In the western and southern coastal regions, wood for fuel or construction purposes would be difficult to obtain.

## E. Significant areas.

(FIGURE II - 85).

Six areas in Korea have particular significance, in that they are situated at or near a natural passage through a barrier area or at a junction of main routes. Control of these areas is probably essential to success of military operations in their vicinity. The limits of these areas are not fixed, but their chief focal points are as follows:

1. Northeastern Korea, especially Ch'ongjin and Najin-dong.
2. Wonsan.
3. Wonsan - Seoul Corridor.
4. Pusan.
5. Seoul.
6. Sinuiju - An-tung.

## F. Routes to significant areas

(FIGURE II - 85).

The two chief routes of Korea are:

1. Pusan to An-tung—approximately 550 miles.
2. Seoul to Onsong—approximately 560 miles via coastal branch, 510 miles via inland branch (Hoeryong). This route branches from the Pusan - An-tung route at Seoul.

There are several alternate routes. One of these extends from Chonui to Mokp'o, at the southwestern extremity of the peninsula. Other alternate routes are:

- Taegu to Suwon, running east of Route 1.
- P'yongyang to Wonsan, connecting Routes 1 and 2.
- Anju to Man'p'o, an alternate approach to Manchuria from Route 1.

The regional terrain descriptions in Topic 22 contain discussions of the principal routes across the various relief regions. All these natural routes are utilized by either road or railroad, or both. The major routes and the terrain regions they cross are both shown in FIGURE II - 79. More detailed descriptions of selected important routes are presented in the ROUTE SUPPLEMENT. The route numbering in the supplement is on a national basis; that in Topic 22 is on a regional basis.

## 22. Description of Terrain Regions

In this topic each terrain region is described in turn. Each such description includes a discussion of relief, drainage and water supply, soil trafficability, and vegetation. Most regional descriptions include a subtopic dealing with routes and with the most important areas within each region.

### A. Accompanying maps.

It is essential that the maps accompanying Chapter II be used concurrently with the text which follows. FIGURE II - 79 locates the regions and subregions described below, shows the routes of each region, and locates the selected representative areas. FIGURE II - 80 is a physiographic diagram of Korea and should be used with the drainage text. FIGURES II - 81 and II - 82 show relief features, the former by means of slope classifications, the latter by elevations. FIGURE II - 83 shows soil trafficability, and FIGURE II - 84 shows natural vegetation and cultivated land. FIGURE II - 85 is an index to through routes and significant areas of Korea. FIGURES II - 86 through II - 100 are detailed maps of selected areas, and illustrate detailed descriptions contained in the text of Topics 22 and 23.

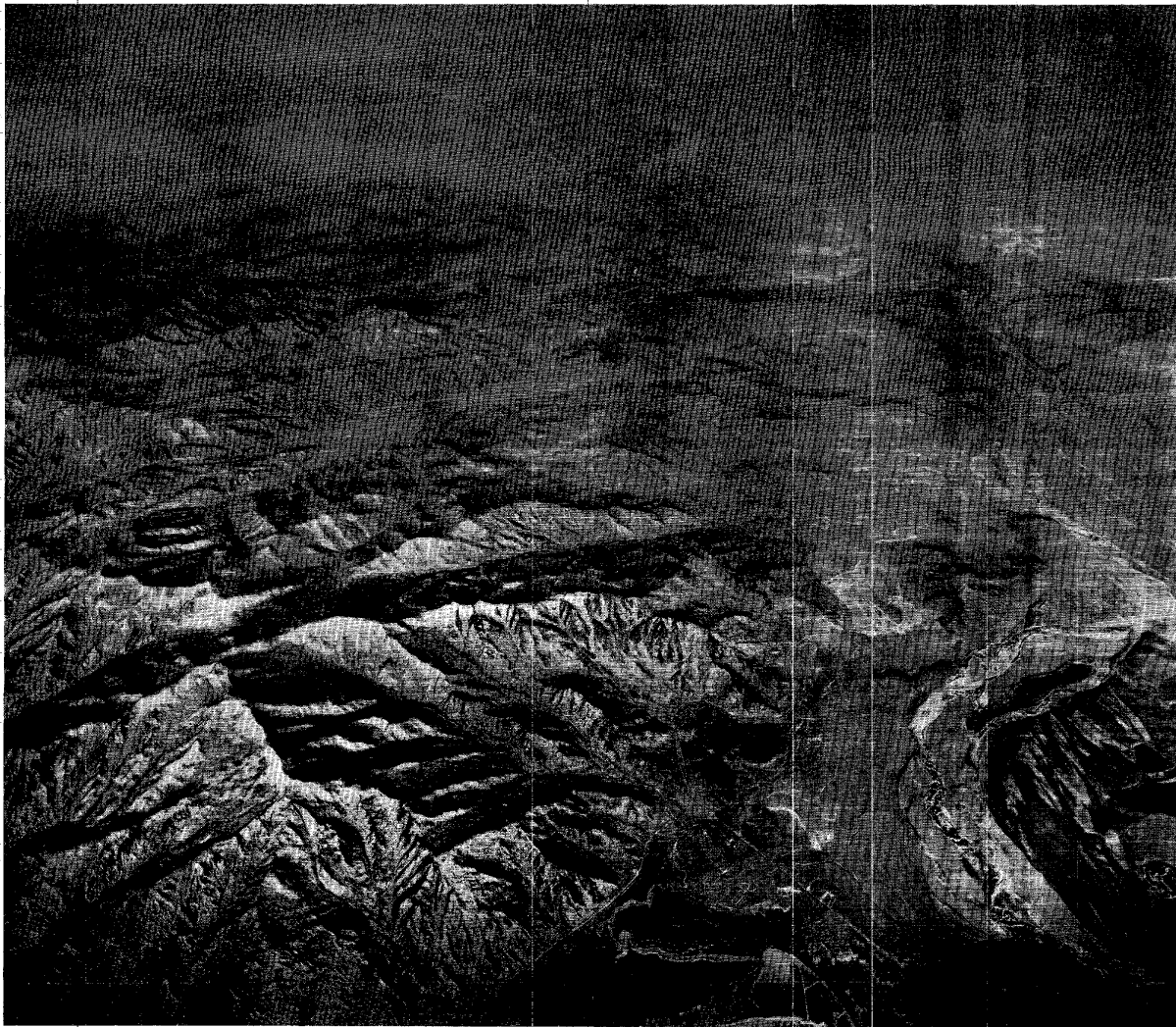


FIGURE II - 1. *Lower Tuman-gang Valley Region.*  
Looking NW over Lower Tuman-gang Valley and adjacent parts of the Northern Korean Highlands. Winding Tuman-gang, right. Unggi, out of picture, bottom. 21 December 1944.

## B. Regional descriptions.

### (1) Region 1. Lower Tuman-gang Valley\* (FIGURES II - 79 to II - 85; PLANS 4 and 51).

This region includes the lower valley of the Tuman-gang from a point near the Manchurian town of T'u-men, downstream to a point on the coast about 15 miles east of Unggi. The Tuman forms the northeastern border of Korea; the lowest 10 miles of the river borders Siberia, and the remainder Manchuria. The distance from T'u-men to Unggi by air is about 50 miles; by rail or road the distance (T'u-men to Unggi) is about 70 miles; by river the distance from T'u-men to the mouth is about 120 miles because the course follows a great bend. The river flows northward past T'u-men town a few miles, then turns eastward. Near Hunyung village, the river turns southward, then southeastward to the sea (FIGURE II - 1). On the Korean side, opposite T'u-men, the valley is about 1/2 mile wide. Near the mouth of the river the Korean portion of the valley is narrow, 50 to 100 yards wide, except at the very mouth where the land stretches low and marshy for 3 miles to the westward. The valley floor is partly cultivated and partly covered with grass and trees. The bordering hills are partly forested and partly in brush or grass (FIGURE II - 2).

(a) *Relief* (FIGURES II - 79 to II - 82). The valley of the Tuman is deep, flat-floored, winding, and of variable width. The width increases to about 2 miles where larger tributaries such as the Oryong-ch'on join the main stream. At many other places the width decreases to a few hundred yards where hills close in and the river passes between cliffs although there are some valley flats well above the present stream bed. Even

\* This discussion refers only to the Korean portion of the Tuman-gang Valley. Little detailed information is available for this area. The Manchurian and Siberian parts of the Tuman-gang Valley are described in JANIS 74 and JANIS 73 respectively.

a mile from the mouth, steep, grassy hills rise close to the Korean side. Extensive deposits of sand, sandy clay, and gravel lie along the sides of the river. The valley floor is flat or gently sloping. Rolling or steep-sided grass- or tree-covered hills, 300 to 1,000 feet high, form the western border of this region. These hills become higher and more rugged farther from the river, merging into the Northern Korean Highlands (Region 3).

1. ROUTES. The Korean side of the Tuman Valley does not provide a practical route inland. It is winding, interrupted by hills coming close to the river, and by tributaries crossing the route. Tributary valleys provide alternate routes westward for small scale operations.

There are 2 important natural routes in this region. One, Route A1, is followed by both railroad and road from Unggi, in Region 2, to Kyonghung. The other, Route A2, is utilized by a road from Kyonghung to Hoeryong in Region 3. The railroad following Route A1 does not run parallel to the road, but neither route is ever more than 5 miles from the river. Road and railroad both follow winding and indirect routes. Route A2 crosses the northeastern corner of Korea partly through the Northern Korean Highlands, and crosses a 1,600-foot pass.

The Tuman-gang itself does not favor movement by water. It is very winding and could be blocked at the numerous gorges. The 15-mile stretch, upstream from the mouth of the Tuman, is bordered by marshes and lagoons and the mouth is partly blocked by a spit. Much of the terrain in the Tuman Valley is suitable for cross-country operations on foot, but is unfavorable for cross-country vehicular operations except during the period from mid-September to mid-November.

2. IMPORTANT AREAS. Two areas along the lower Tuman are important. The Kyongwon-Hunyung area is a meet-

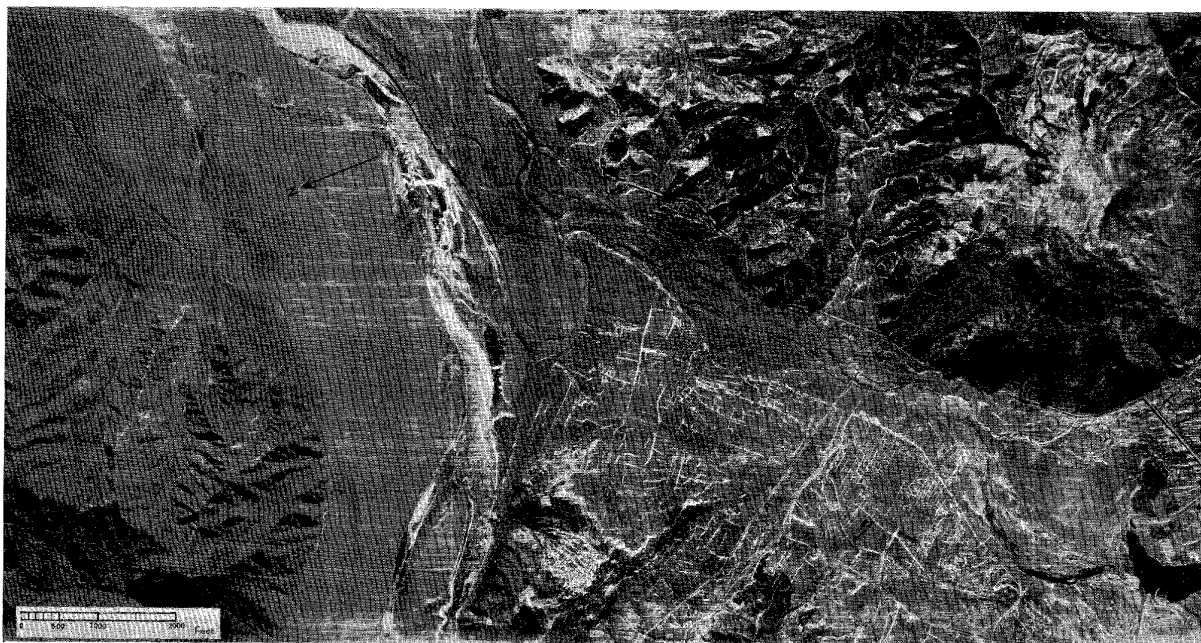


FIGURE II - 2. Lower Tuman-gang Valley Region. Near Sinasan. 42°30' N, 130°30' E.  
The winding Tuman has steep banks. Valley lands are cultivated and ditched. Tributary streams are entrenched below the valley floor.  
Partly forested hills command the valleys. December 1944.

ing place for roads and trails. Two roads and one railroad cross the Tuman here into Manchuria. The valley is a mile wide on the Korean side and is partly covered with grass and crops, and partly bare. The lower areas of this part of the valley are subject to floods. North and south of this area, the hills close in, and the Tuman flows in a narrow gorge.

The second area is on the Korean side of the Tuman, east of the Manchurian town of T'u-men. It has a railroad crossing, but no motor road. Rolling, grass-covered hills lie about  $\frac{1}{3}$  mile from the Korean side of the river, and enclose a narrow alluvial lowland about 1 mile long. The river here is about 150 yards wide. The flat valley area on the Manchurian side is much larger.

(b) *Drainage* (FIGURE II - 80). The Tuman-gang is the only major river of Korea which flows eastward. The river drains an area of more than 15,000 square miles, but only about  $\frac{1}{3}$  of its basin is in Korea. The main stream rises on the southeastern slopes of Paektu-san and other mountains, and gradually increases in size as it flows seaward. The Tuman-gang is more than 300 miles long; within this distance, it falls from an elevation of about 4,000 feet at its source to sea level. With its tributaries it drains the northeastern subregions of the Northern Korean Highlands (Region 3). The entire Tuman-gang drainage system is deeply entrenched, and most streams composing it flow in winding courses.

The Tuman-gang is one of Korea's widest rivers. It has an average width of 700 to 800 yards at the spit which partly blocks the river mouth. Directly behind the spit the width is 1 mile. About 8 miles up the river at Shang-so (Manchurian side), the river is more than  $\frac{1}{2}$  mile wide. Beyond Shang-so, the river has an average width of  $\frac{1}{4}$  to  $\frac{1}{2}$  mile for 10 to 15 miles upstream to Koup-tong. Farther upstream, near Ho-yang-tao where the large Manchurian tributary Hun-ch'un Ho joins the Tuman-gang, the river narrows to a width of 250 to 350 yards. The river gradually narrows to 100 to 200 yards for most of its remaining upper course. In the distant narrow gorges of the upper Tuman the river is only 20 to 50 yards wide.

Available sources give few details concerning depths of the Tuman-gang. The average depth in the entrance to the Tuman-gang, in 1923, was about 6 feet. Generally, the river is shallow except during the spring thaws and the summer rains when it is swollen to flood stage. Normally, the river is navigable to light craft (motor boats) for about 50 miles upstream. During the winter the Tuman-gang is frozen for 3 to 4 months annually.

The western (Korean) bank of the Tuman-gang is very low for a distance of about 1 mile from its mouth. The eastern bank for the same distance is a low marshy plain. Upstream from this lower section, the banks of the main stream and its tributaries are dominated by hills and ridges which border the river throughout most of its upper course. Alternately, where deeply entrenched tributaries flow from the highlands into the main river there are small lowland areas breaking the continuity of banks. In these lowland areas and near the tributary mouths the banks are of sand and gravel. In the numerous bends of the river, the banks on the inside of curves are usually low and are of sand and gravel. Most of the cliffs bordering the valley bottom are from 100 to 300 feet high or higher. Upstream, rock ledges and cliffed outcrops are common.

The Tuman-gang has a 1- to 3-mile wide flood plain for about 1 mile upstream from its mouth. Above this the flood plain is relatively narrow, and the river is confined for long stretches between cliffs. Small flood plains occur on the insides of the many curves and where the tributaries join the main stream. These flooded areas are relatively narrow (400 to 800 yards wide) and consist mostly of sand, gravel, and boulders.

The bottom of the river is sand and gravel in its extreme lower course. In much of its upper reach, the river has a rocky bed and many rapids. The river channel is divided by numerous islands, especially where the Tuman-gang flows southward from Hunyung and the valley broadens into a large plain.

(c) *Soil trafficability* (FIGURE II - 83). The soils of the Lower Tuman-gang Valley Region vary considerably from place to place, and include stony sandy loams, loams, clay loams, and clays. There are a few small rice paddy areas adjacent to the Tuman River which are flooded and nontrafficable from June through September. Many of the soils have a high peat content and hold moisture longer than soils of similar texture in southern Korea. The soils are most trafficable from mid-September through mid-November. Snows occurring during the period from late November through March make the winter season somewhat less favorable for cross country movement of wheeled vehicles. Snow cover seldom accumulates to depths of a foot in the coastal lowlands, but drifts of 2 feet are common in other areas. The soil freezes during the middle of November and usually remains frozen through the winter. Soil freezing is deep enough to aid trafficability where the snow cover is light or absent. The Tuman River usually freezes over during late November. During March and April melting snows and thawing soil result in high soil moisture content, and the lowland clay and loam soils will mire vehicles almost everywhere. Ice on the Tuman-gang usually breaks up during late March. During May and early June trafficability conditions are generally improved, although frequent light rains make the lowland clays slippery and muddy. The highest occurrence of heavy rains and rainy days is from late June through early September, and trafficability conditions are frequently poor, particularly in lowland areas of clay, clay loam, and loam soils.

(d) *Vegetation* (FIGURE II - 84). The flat-floored, winding Tuman Valley is largely without forests. Operational difficulties imposed by relief are much greater than those caused by vegetation. The steep western borders are grass- and scrub-covered hills and ridges which extend irregularly close to the river banks. Ground observation is good, and is limited only by the winding valley, and by thickets scattered on the valley floor and along the steep to gently sloping sides. Where the valley widens there are patches of cultivated fields. Some rice is grown, but the cultivated vegetation is largely millet, barley, buckwheat, potatoes, and low-growing vegetables. There is no double cropping.

Some stretches on the flood plain are barren where the valley floor widens, although usually wherever alluvial deposits are extensive, the area is cultivated. One of the largest of the cultivated areas is south of Hunyung where the Tuman-gang flows through a 15-mile-long plain. The tributaries flow across cultivated alluvial valleys where they enter the main valley. Observation is good in these places especially from the upper parts of the alluvial fans where the streams flow into

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the main valley. Patches of cultivation extend in a ribbon pattern for short distances up the tributaries.

The dominant type of natural vegetation on the Tuman Valley floor is bunch grass. There are no extensive meadows along the valley, though limited forage supplies might be available. The region is entirely within the mixed broadleaf and coniferous region, but forest growth is scattered and patchy. Common trees are poplar, willow, oak, and pine. These wooded sections and areas of brush and sparse grass, particularly along the valley sides, provide concealment for small groups of men. Most of the trees are of secondary or tertiary growth. Some timber for construction purposes and fuel would be available especially on the higher elevations of the valley slopes.

(2) *Region 2. East Coast Lowlands and Hills* (PLANS 4, 5 to 16, and 51; FIGURES II - 79 to II - 84).

This region includes the numerous small east coast lowlands and most of the hilly coastal terrain drained by rivers

flowing eastward into the Sea of Japan. From the Tuman Valley it extends generally southward more than 600 miles to the southeastern part of Korea, east of Pusan. It extends 5 to 25 miles inland from the Sea of Japan.

(a) *Relief* (FIGURES II - 79 to II - 82). The coast is mostly high and steep; rocky promontories alternate with small lowlands at the bay heads (FIGURE II - 3). The promontories rise steeply, 300 to 2,000 feet. The largest east coast lowlands are located near Unggi (FIGURE II - 4), Ch'ongjin (FIGURE II - 5), Songjin, Pukch'ong, Hamhung - Wonsan (FIGURE II - 3), Yongil-man (FIGURE II - 86), and Ulsan-man.

The lowlands of this East Coast Region are a succession of semi-isolated coastal pockets, separated by hill spurs reaching the sea. These lowlands are roughly similar in their characteristics. They consist of flat or gently sloping, intensively cultivated valley floors, generally 3 to 5 miles long and not more than a mile wide, and usually shaped like a long, narrow triangle (FIGURE II - 6). On the coastal side are sand or cobble

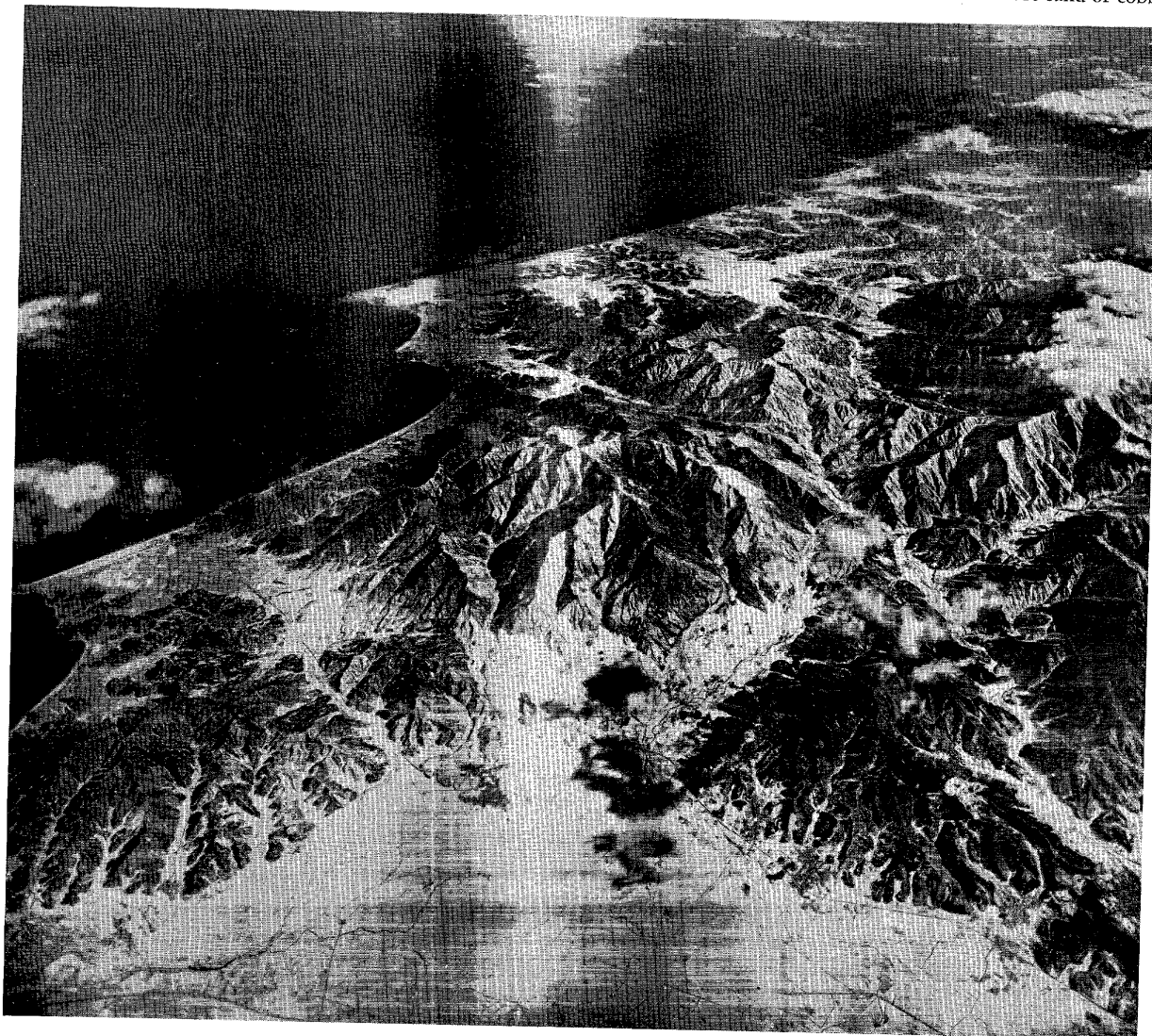


FIGURE II - 3. *Eastern Coast Lowlands and Hills Region.*  
[Looking SE. The S end of the Hamhung - Wonsan Lowland appears in the foreground, lower left. Hills and mountains of the Southern Taebaek Range overlook the lowland from the south (right center). December 1944.

beaches backed by lagoons or by stream estuaries parallel to the shore. On the land side, hills or mountains, rising from a series of terraces, or starting abruptly from the lowlands, command the entire area (FIGURE II-7). Each lowland has its principal river, usually a winding, shallow, debris-filled stream, confined between dikes to protect the adjacent lowlands from floods (FIGURES II-8, II-9, and II-10). Many of the stream beds are raised a few feet above the general level of the lowland because of the heavy load of gravel and sediment carried down and deposited. Narrow, stony flood plains

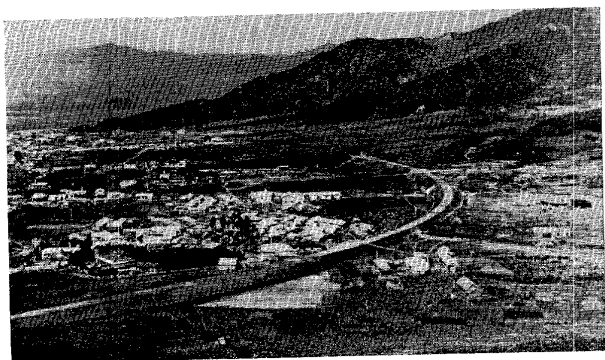


FIGURE II-4. *Eastern Coast Lowlands and Hills Region. Unggi. App. 42°20'N, 130°24'E.*

Looking westward. The small lowlands of the east coast are dominated by steep hills and mountains. Gentle slopes between mountains and plain are used by transportation facilities. Unggi Harbor is shown in FIGURE VI-2. After 1932.

occupy thin belts between the streams and the cultivated areas (FIGURE II-11). Rice fields, flooded in summer, occupy much of the flat land and some terraces; dry crops are grown on hillsides and on small patches of lowland (FIGURE II-6). The hills are partly covered with grass, scrub, or trees, or are bare. Routes inland are mostly winding and steep-sided; cross country movement is difficult (FIGURE II-12).

There is some variation in the character of the terrain in different parts of the region. North of Hamhung, the larger lowlands average about 5 miles wide and extend about 8 miles inland (FIGURE II-8). The smaller lowlands average a mile broad and extend about 5 miles inland (FIGURE II-3). There are only 2 of the larger lowlands south of Wonsan. These are near Yongil-man and Ulsan-man. They are 6 to 8 miles broad and, with connecting valleys, extend 10 to 20 miles inland. Other lowlands are even smaller than those in the north, and average a mile or less in breadth and extend only 3 to 5 miles inland.

In the northeast, near the Tuman Valley, the hills are lower and rolling, rising 300 to 1,000 feet above sea level (FIGURE II-1). The valley sides are steep, but the low coastal areas are more extensive in this section. West of Ch'ongjin a plain extending about 6 miles along the coast and approximately 7 miles inland, leads to an important road and rail route northward to Manchuria (FIGURE II-8).

South of the Ch'ongjin Lowland lies a coastal highland about 1,000 feet high, consisting largely of volcanic ash, lava cones, and other volcanic features (FIGURE II-13). From its rugged surface several peaks rise to 1,600 to 3,000 feet.

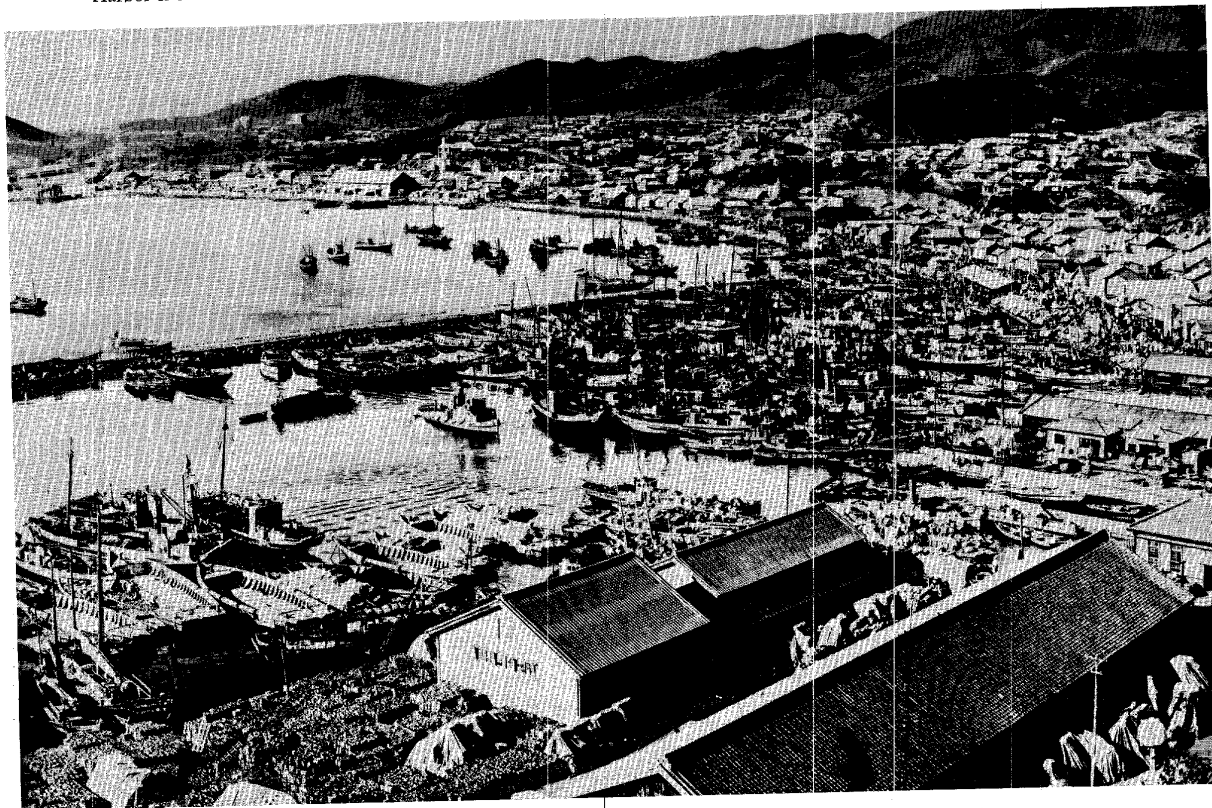


FIGURE II-5. *Eastern Coast Lowlands and Hills Region. Ch'ongjin. App. 41°46'N, 129°49'E.*  
Looking northwestward. Ch'ongjin is at the E edge of one of the larger east coast lowlands.



FIGURE II - 6. *Eastern Coast Lowlands and Hills Region. Near Honam. App. 39°50'N, 127°35'E.*  
 Looking NW. Northern part of the Hamhung - Wonsan Lowland. Valley floors are flat and mostly cultivated. Some slopes are in dry crops. Hills are partly forested. Note grave mounds on slopes and hilltops.

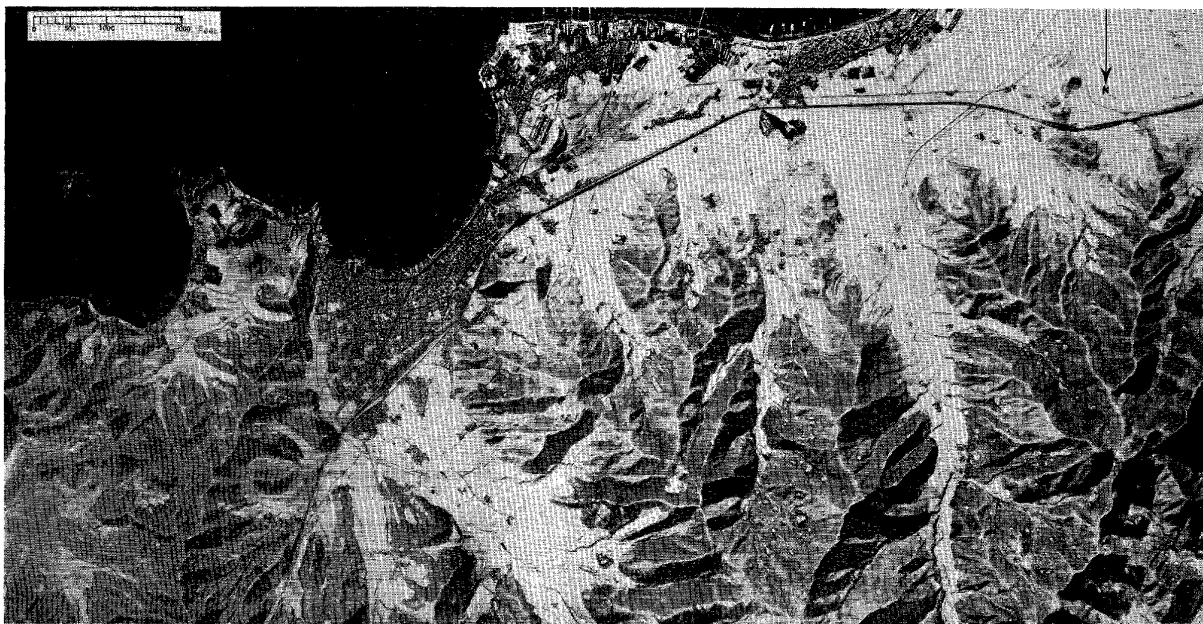


FIGURE II - 7. *Eastern Coast Lowlands and Hills Region. Sinp'o. App. 40°03'N, 128°13'E.*  
 Narrow coastal lowland and tributary valleys are mostly cultivated. Hills, center, are probably being reforested. Sinp'o town, center. East coast rail route crosses from lower left to upper right. Road is 5 miles inland. December 1944.

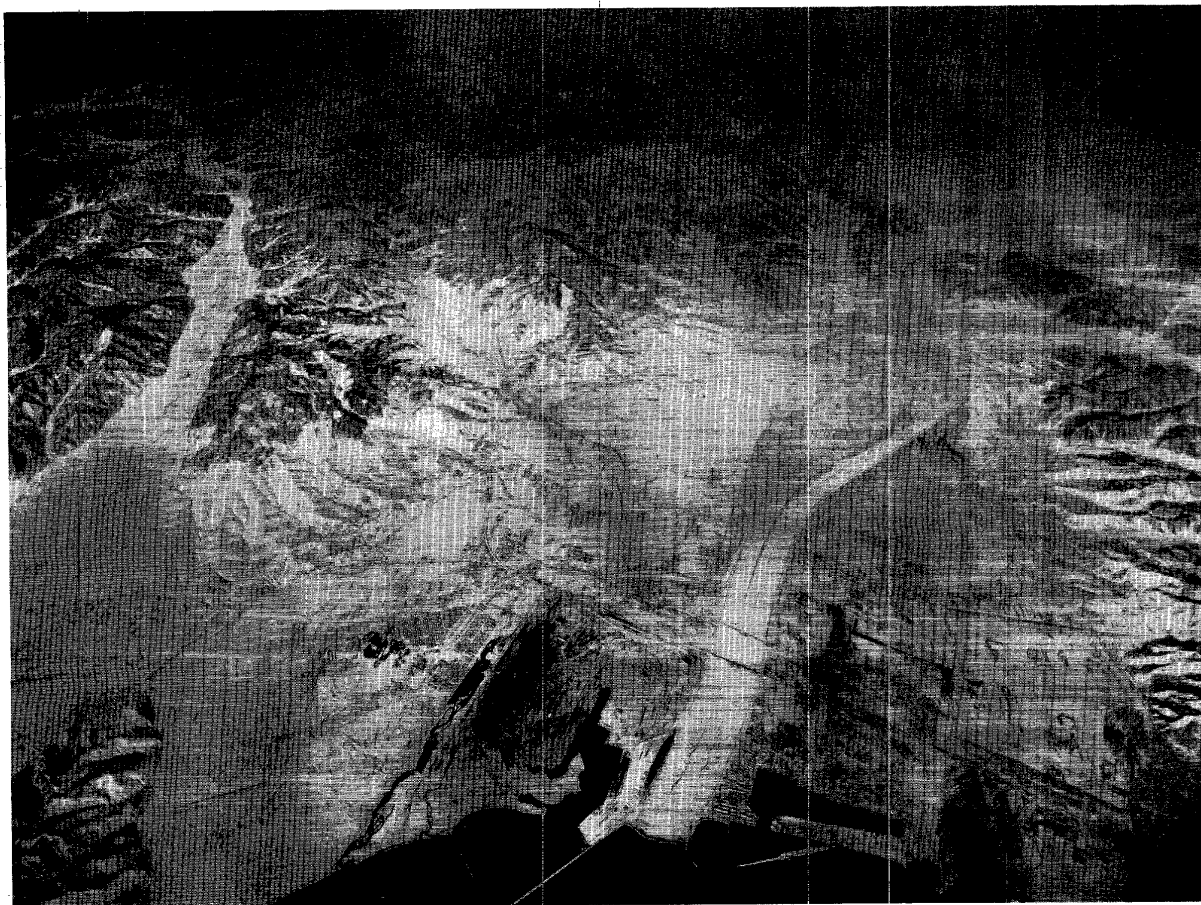


FIGURE II - 8. *Eastern Coast Lowlands and Hills Region. Ch'ongjin. App. 41°46'N, 129°49'E.*  
Looking NW. The lowland at the mouth of the Susong-ch'on extends about 6 miles SW from Ch'ongjin and about 8 miles inland. The lowland is partly cultivated in rice, and is drained by numerous rivers, canals and ditches. Road and rail routes lead inland to Hoeryong, on the Manchurian border. December 1944.

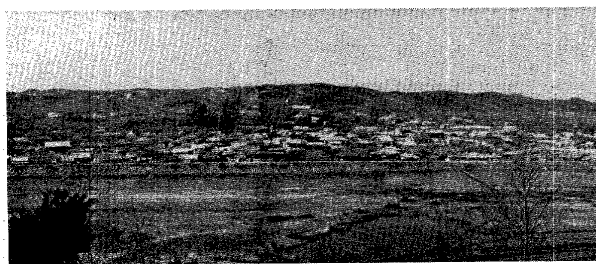


FIGURE II - 9. *Eastern Coast Lowlands and Hills Region. Kangnung. 37°45'N, 128°55'E.*  
Probably looking NW. View across Namdae-ch'on toward the town. Dikes border the partly dry river. Low hills, partly covered with grass and scrub, in background, beyond cultivated fields. Before 1931.

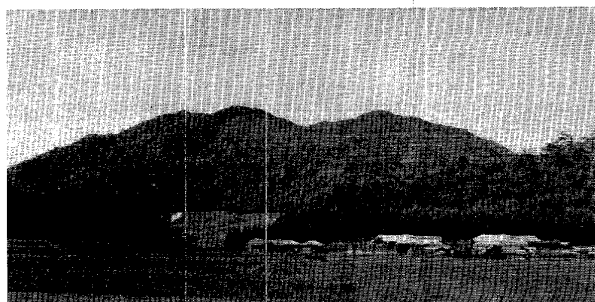


FIGURE II - 10. *Eastern Coast Lowlands and Hills Region. Near Kangnung. App. 37°43'N, 128°48'E.*  
Flat, mostly bare valley floors. Hills have forest in various stages of development. Most parts of the east coast are not so densely forested.



FIGURE II - 11. *Eastern Coast Lowlands and Hills Region.*  
*Kyongju. App. 35°50'N, 129°15'E.*

View probably E. Kyongju is at the junction of routes from Yongil-man and Ulsan-man. From here a road and railroad lead westward to the Naktong-gang Basin. Valley here is about 1 mile wide. Stream bed is only partly covered with water. Isolated hills rise from plain. Before 1931.

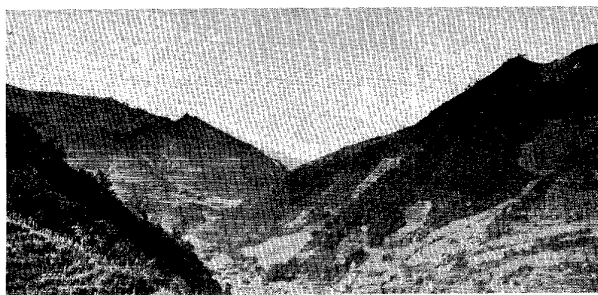


FIGURE II - 12. *Eastern Coast Lowlands and Hills Region.*  
*Near Ulsan. App. 35°34'N, 129°20'E.*

Valleys leading inland become narrow and winding. Hills are partly covered with grass, scrub, and trees. Small areas are terraced, or in fire fields. Reforested patches are on steepest slopes. 1914.

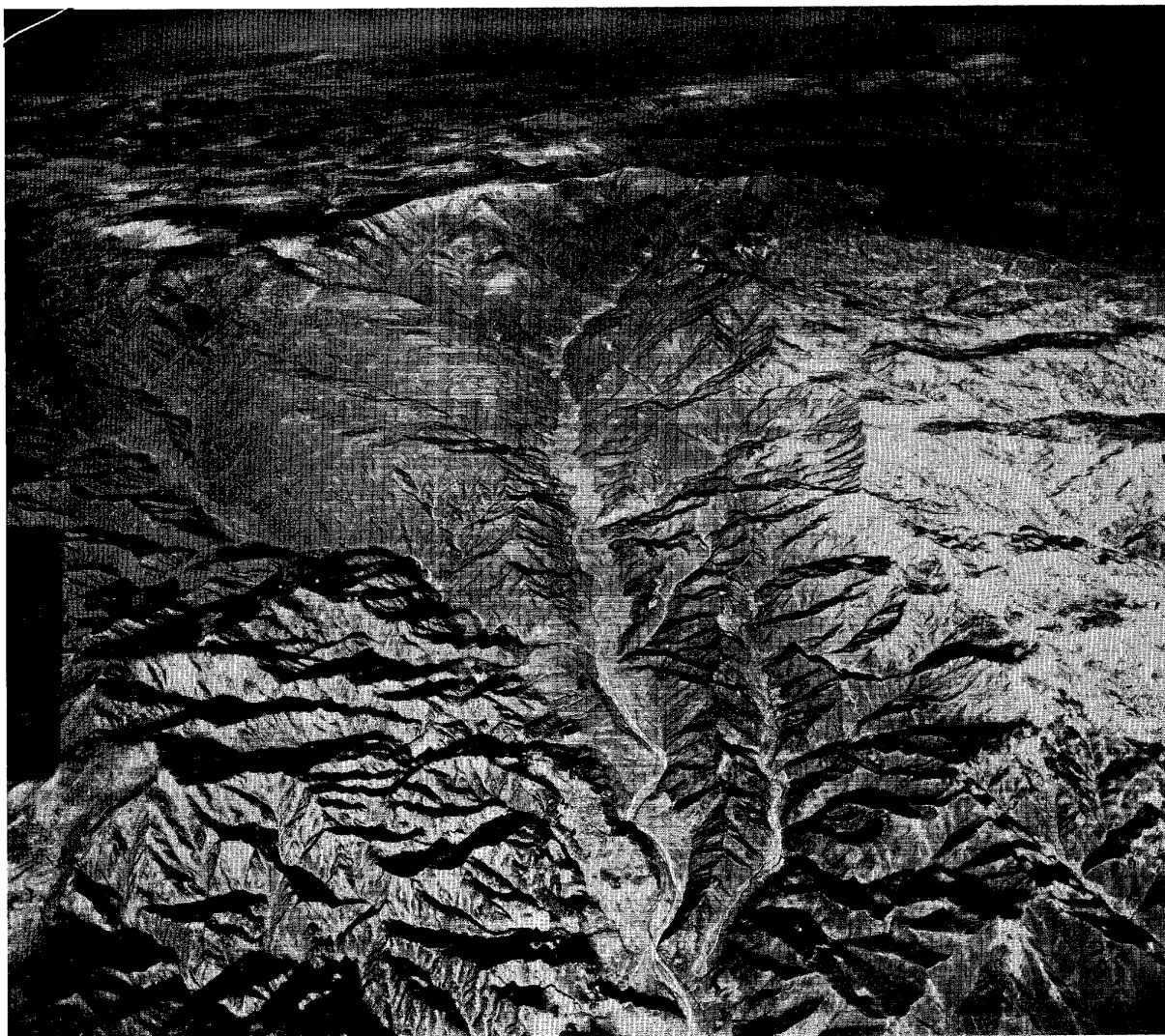


FIGURE II - 13. *Northern Korean Highlands Region. Namdae-ch'on Valley. App. 41°05'N, 129°15'E.*

Looking NW up the winding valley of the Namdae-ch'on, toward the flattish uplands of the Kaima Plateau. Part of the Songjin-Hyesanjin and Songjin-Munsan road and rail routes follow the Namdae-ch'on Valley. December 1944.

Access inland from the coast is difficult. The main east coast road and rail route detours more than 15 miles inland and across a 1,400-foot pass. The approaches to this pass are steep and narrow for a mile to north and south, and the pass itself crosses an irregular ridge about 1½ miles long, and 1,400 to 1,500 feet high.

South of the highland the coast trends southwestward for about 90 miles. It is a succession of cliffed promontories which are a few hundred to 1,000 feet high, separated by small, flat lowlands and narrow stream valleys (FIGURE II - 7). For about 50 miles southward from Hamhung the coastal area is mostly lowland (FIGURES II - 14, II - 15, II - 16) extending inland for 10 to 20 miles. Two or three hilly spurs, rising to 1,500 feet, extend eastward across this lowland nearly to Tongjŏson-man (Nishi-Chōsen-wan). These hills channel east - west movement into the intervening valleys; north - south movement requires the crossing of 300- to 600-foot passes (FIGURE II - 3). Southeast of Wonsan this lowland section merges into the north end of the Wonsan - Seoul Corridor (Region 5), which, despite formidable difficulties, provides the most favorable east - west passageway across Korea.

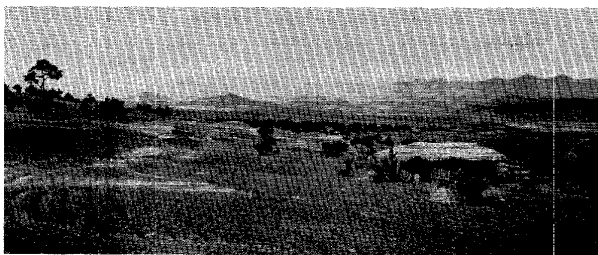


FIGURE II - 14. Eastern Coast Lowlands and Hills Region.  
Near Wonsan. App 39°11'N, 127°30'E.

A dry-field area along the edge of the southern part of the Hamhung-Wonsan Lowland, the largest lowland along the east coast. 1917.

From a point 10 miles east of Wonsan, the coast trends southeastward and southward about 300 miles to the limit of the region near Pusan. With the exception of two large bay-head lowlands, at Yongil-man and Ulsan-man, the coast is a succession of steep, rocky headlands, and small lowlands (FIGURE II - 9). Some of these lowlands are situated near Kosong, Kojin-ni, Samch'ok, Chukpyon-ni, Yonghae. The lowlands are drained by short, swift streams. Their seaward edges are in most cases blocked by sand bars and lagoons. All these coastal lowlands are dominated by nearby hills.

1. REPRESENTATIVE AREAS. Two areas within the East Coast Lowlands and Hills Region have been selected for detailed description. Terrain conditions in these areas are, with minor differences, representative of other areas in their vicinity.

a. CH'ONGJIN LOWLAND (FIGURE II - 86). Ch'ongjin is at the eastern end of a flat lowland which extends about 6 miles along the coast and about 7 miles inland (FIGURES II - 5 and II - 8). Although this lowland is larger than most of those along the east coast, the terrain characteristics here are similar to those of the smaller coastal lowlands in the northeast. Several small winding streams cross the lowland. These streams are diked, and are bordered by stony parts of the flood plain, in this instance 10 to 400 yards wide, with patches of grass or trees. Other parts of the valley are planted to rice or dry crops.

The stream mouths are almost blocked by bars, forming lagoons behind the shore (FIGURE II - 8). The bars are capped by grass-covered dunes, about 10 feet high, fronted by a cobbly beach. The elevation 7 miles inland is about 55 feet. The whole lowland, like others along the east coast, is dominated by steep, 300- to 1,500-foot hills, partly covered with grass or trees. Soils are sand, gravel, and clay on the lowlands and well-drained, dark colored loam on the hills. Roads and railroads are on embankments in the lower parts of the valley or go along the sides of the valley, next to the hills. When the surface of the lowland is dry or deeply frozen, terrain conditions favor rapid cross country movement. Terrain conditions in the lower hills do not favor vehicle movement, but would not hinder operations on foot.

b. YONGIL-MAN LOWLAND (FIGURE II - 87). One of two large lowlands in the southern part of Region 2 lies at the head of Yongil-man, and is possibly the best lodgment area south of the Hamhung - Wonsan Lowland. Exits are available into the Naktong-gang Basin (Region 7). The rail junction of P'ohang-dong is at the northern end of the Yongil-man area.

Several winding streams, the largest about 100 yards wide, drain the lowland. Like other east coast streams, most of these have steep banks, and in places the streams are diked. A narrow belt along the streams is stony, periodically flooded, and is bare or has patches of grass or trees. Most of the lowland is in rice fields. Bars nearly block the stream mouths, forming lagoons behind the shore. Grass-covered dunes 10 to 15 feet high are situated just behind the wide, sandy beach.

Steep hills, 300 to 700 feet high and mostly grass covered, command the lowland from the south. From the northwest, lower hills, covered with grass and trees, command the lowland. These hills are 100 to 300 feet high and have more moderate slopes than the hills to the south. Soils on this lowland are sand, gravel, or clay. Soils on the hills are dark colored and well drained.

There are numerous narrow passages through the hills. Such passages extend inland from most southeast coast lowlands (FIGURE II - 12). The main east coast road and railroad follow the western side of the lowland. A cliff-sided gap, about 200 yards wide and about 800 yards long, at the western end of the lowland could be blocked. Similar potential bottlenecks are found near many lowlands on the east coast. North of P'ohang-dong, the road follows a narrow passage through the hills. Farther north the road crosses a succession of numerous hills and small lowlands on the way to Wonsan. The roads across the lowlands do not appear to be on embankments. Southward, the road and railroad follow a winding valley ½ to 2 miles wide, to Kyongju (FIGURE II - 11). At Kyongju this route joins a similar one from Ulsan-man, and goes westward into the Naktong-gang Basin. Operations inland via these routes could flank Pusan. In dry weather terrain conditions on this lowland and over these routes favor rapid vehicle movement, but numerous narrow places along the routes, such as at the western end of the lowland, could be blocked. Terrain conditions in the hills do not favor vehicle operation, but would not hinder operations on foot.

2. ROUTES (FIGURES II - 79, and II - 81). The terrain along the east coast favors large-scale operations only on the lowland north of Wonsan and, to a lesser extent, on such lowlands as those near Ch'ongjin, Yongil-man, Ulsan-man, and

Restricted

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FIGURE II-15. *Eastern Coast Lowlands and Hills Region. Wonsan. App. 39°10'N, 127°25'E.*  
The town of Wonsan, military installations, cultivated lands and drainage features occupy the low areas. The dark areas are steep hills in, and bordering, the lowland. December 1944.

others (FIGURES II-5, II-7, II-8, and II-17 to II-21). North-south movement along the coast is subject to frequent interruptions because of streams and ridges. The terrain is most favorable for movement inland over routes starting from Ch'ongjin (Route B-1), from near Wonsan (Route B-2), and from Yongil-man and Ulsan-man (Route B-3).

a. ROUTE B-1. The route from Ch'ongjin northward to the Tuman-gang and Manchuria rises gradually in a mile-wide valley to elevations of about 300 feet. Beyond the limits of this region, in the Northern Korean Highlands, the valley narrows considerably and, about 27 miles north of Ch'ongjin, climbs rapidly to 2,300 feet. Both road and railroad follow this route.

b. ROUTE B-2. The most favorable east-west route across Korea leads southward from Wonsan to Seoul. The east coast portion of this route rises less than 600 feet in a 3- to 4-mile-wide valley. The highest point of the route, near the village of Wonnam-ni, in Region 5, is at 2,035 feet elevation.

c. ROUTES B-3. The routes inland from Yongil-man and Ulsan-man lead over passes not higher than 400 feet, through valleys ½ to 3 miles wide, and into the basin of the Nakdong-gang.

(b) *Drainage* (FIGURE II-80). Most of the rivers of this region are short, torrential streams. They flow in restricted valleys down the steep slopes of the eastern mountain ranges which lie a short distance inland from the coast. Most of them

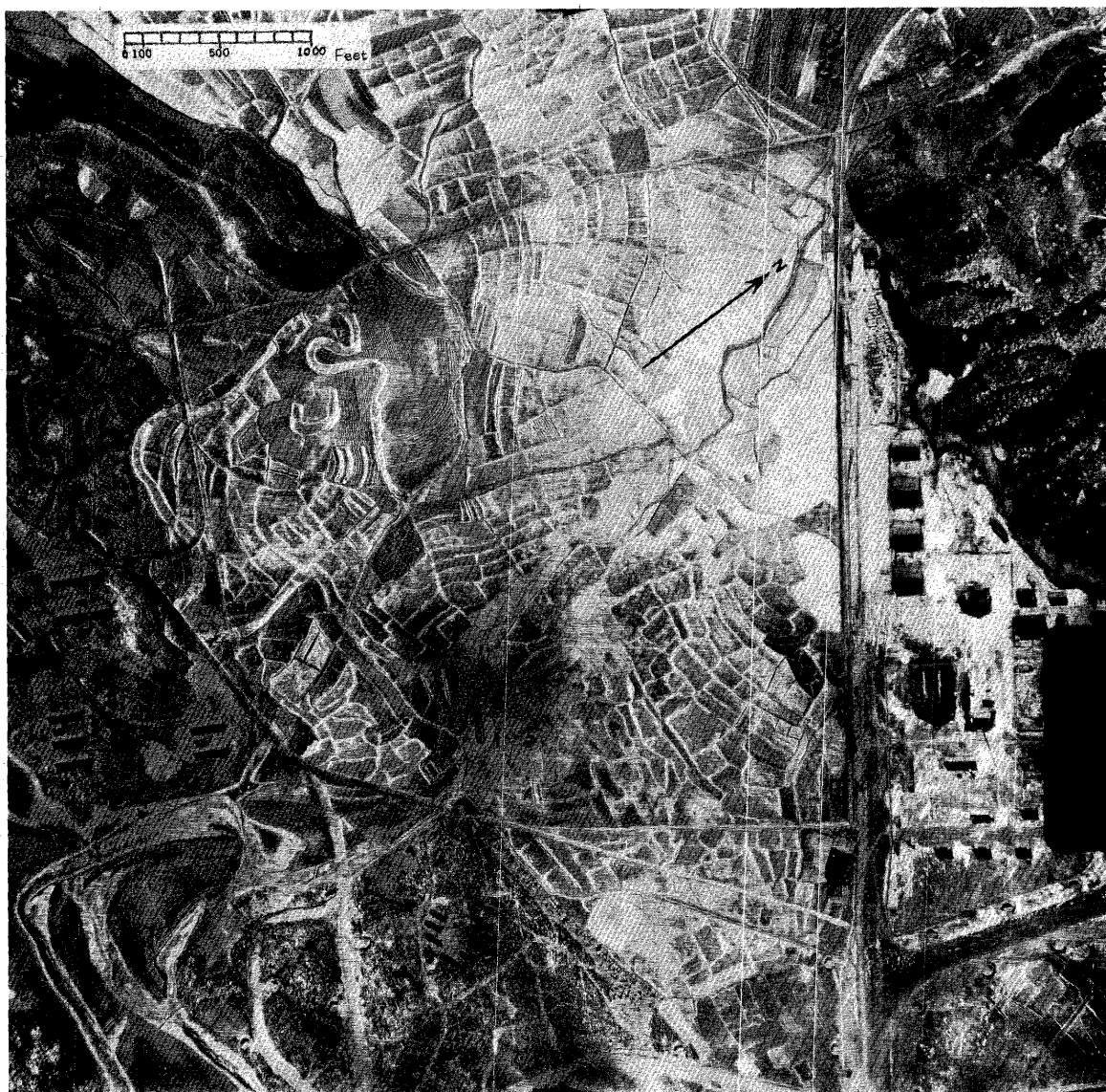


FIGURE II-16. Eastern Coast Lowlands and Hills Region. Near Wonsan.  $39^{\circ}10'N$ ,  $127^{\circ}25'E$ . Rice fields occupy valley lands and terraced gentle slopes. Hills at top and left. December 1944.

provide very poor routes into the interior. None of Korea's major rivers is within this region.

The streams average only 10 to 25 miles in length. The Orang-ch'on, Namdae-ch'on (FIGURE II-13), Yonghung-gang, Kumjin-ch'on and Tongsongch'on-gang are among the largest rivers. From their source to the foot of the mountain slopes the streams have a very steep gradient, rocky beds and banks, and usually have many rapids and falls. In their lower reaches these streams flow through steep, narrow valleys, and carry vast amounts of debris (FIGURES II-8, II-9, II-11). In their extreme lower courses, the streams flow across small coastal lowlands which are usually intensively cultivated (FIGURE II-20).

The rivers are mostly very shallow. The average normal depths in the lower courses of the larger rivers are only 2 to 3

feet at points 2 miles inland, and 1 to 2 feet at points 3 miles inland. They are practically unnavigable and are fordable in numerous places. During flood season, however, the streams become raging torrents, and flood the valleys and cultivated lowlands near the coast. Many of the streams are confined between dikes to protect the adjacent lowlands from floods (FIGURE II-9). The stream beds along the upper courses, where rapids and falls occur, are mostly rock. Downstream, where the heavy load of sediment is deposited, the stream beds are mostly sand and gravel. On the lowlands, most of the stream beds are raised a few feet above the general level due to the great amount of debris (rocks, gravel, sand) carried downstream. Near the coast, the gradient and current decrease and the banks average 3 to 5 feet high.

Restricted

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FIGURE II - 17. *Eastern Coast Lowlands and Hills Region.*  
*Near Chuulomjang. App. 41°33'N, 129°39'E.*  
 Looking S. Partly forested hills rise from the coast, S of lowland shown  
 in FIGURE II - 18. Many small pocket beaches dot the E coast.  
 Railroad tunnel, right. 1939 or before.

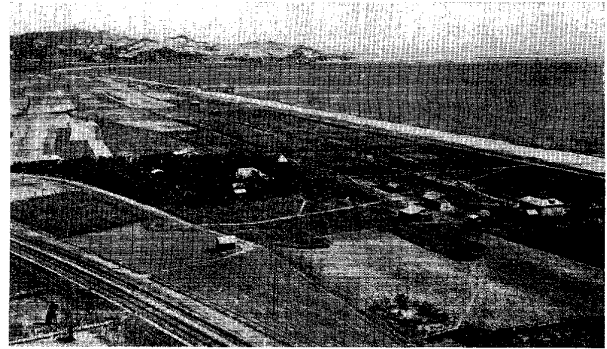


FIGURE II - 18. *Eastern Coast Lowlands and Hills Region.*  
*Chuulomjang. App. 41°33'N, 129°39'E.*  
 Looking N. One of the smaller east coast lowlands, flat and mostly  
 cultivated. Hills to the N (in background) command  
 entire lowland. 1939 or before.

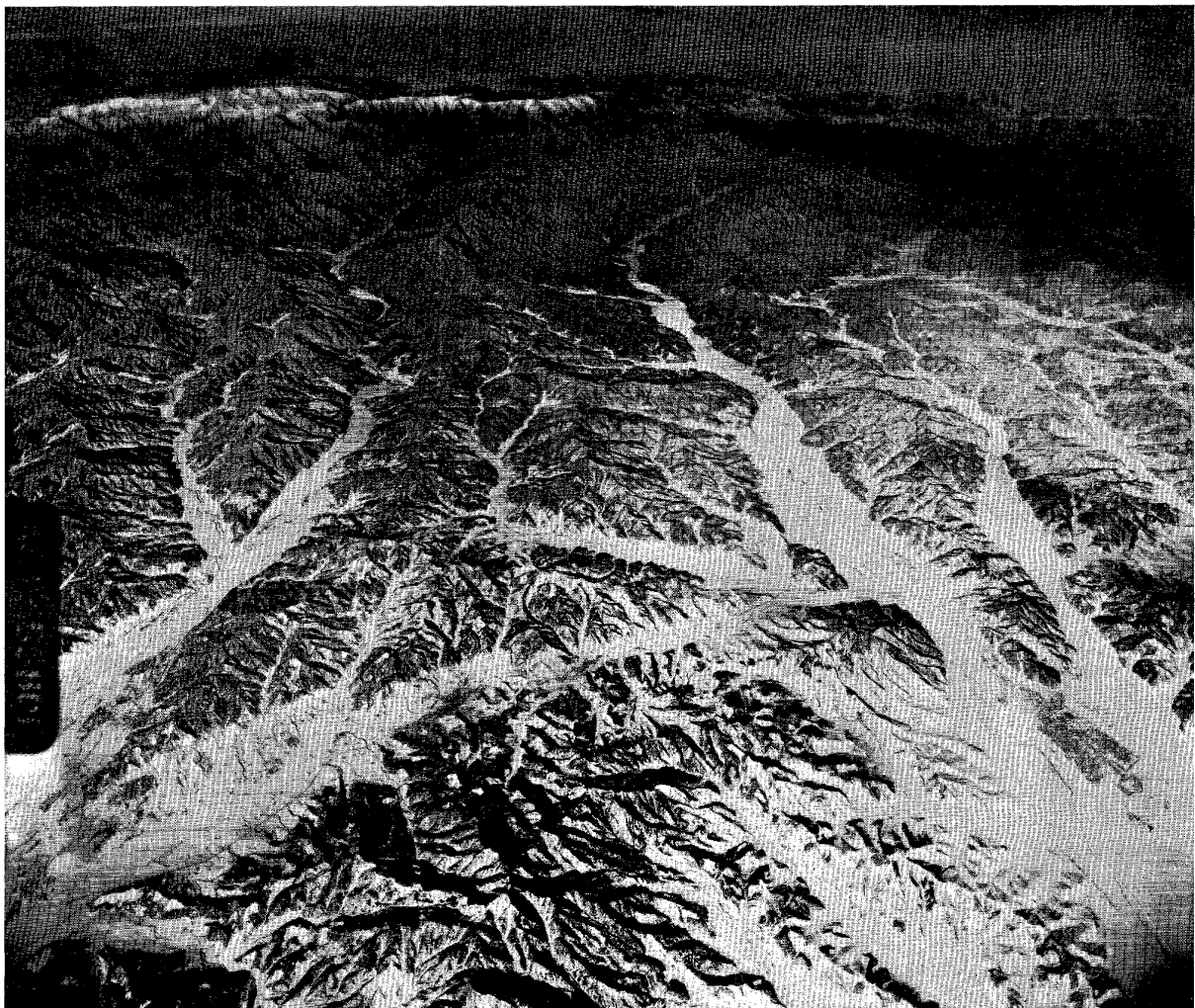


FIGURE II - 19. *Eastern Coast Lowlands and Hills and Northern Korean Highlands Regions. App 41°36'N, 129°40'E.*  
 Looking NW, from near Kyongsong, lower right, across the Northern Korean Highlands. The Och'on-ch'on Valley, right, is a representative  
 east coast valley, a mile or two wide, drained by a swift, stony stream, and mostly cultivated. December 1944.

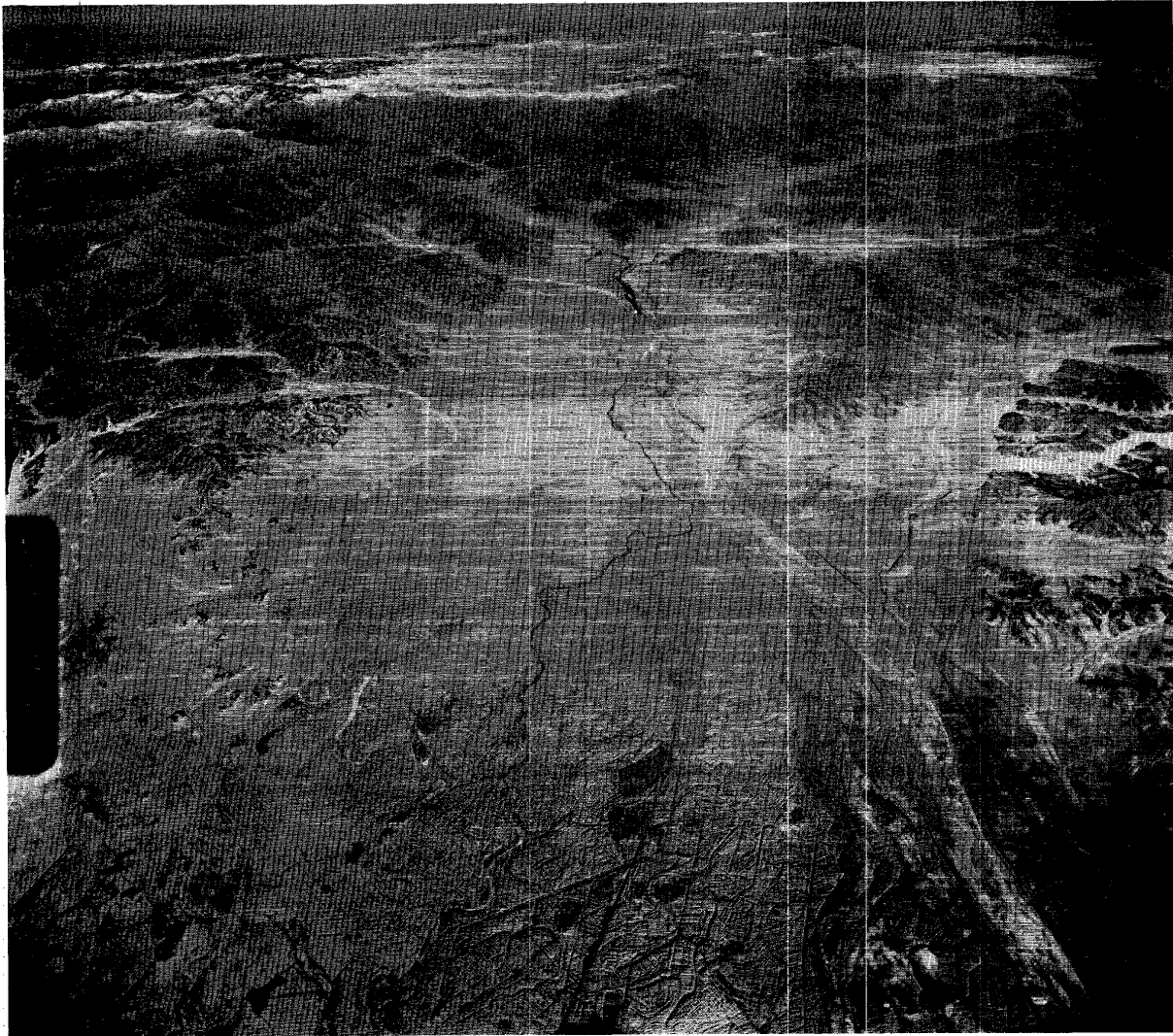


FIGURE II - 20. *Eastern Coast Lowlands and Hills Region. App. 39°50'N, 127°30'E.*  
Looking N from Hamhung-Wonsan Lowland. Hamhung, right center. Lowland, in lower foreground, is mostly in rice fields. Tongsongch'on-gang, right, is frozen. December 1944.



FIGURE II - 21. *Eastern Coast Lowlands and Hills Region.*  
*Najin-dong. 42°13'N, 130°17'E.*

Looking approximately SW. Lowlands along the east coast are small and flat. A few small islands lie offshore. In foreground, bordering plain proper, is flat-topped, eroded terrace. 1934.

The flood plains are narrow, varying from 10 to 300 or 400 yards wide. Along the upper courses of the streams, the flood plains are very stony. Downstream, finer and lighter gravel and sand are widely deposited over the lowland areas during floods. The flood plains are either barren or covered with thinly scattered patches of grass.

The banks along the upper sections of the mountain streams are mostly cliffs 50 to 100 feet or more high. Along the lower courses, the banks gradually decrease in height and are largely bluffs of sand and gravel (FIGURE II - 22). Where the stream channels cross the coastal lowland areas the stream bed rises and the banks are only 5 to 10 feet high.

At normal water level, the streams along the eastern coast are only secondary barriers. Throughout the region many of the main and tributary streams are intermittent, except during the rainy season, when they flow continuously. Those streams in the northern part of the region are frozen 2 to 3 months annually (FIGURES II - 8, II - 20).

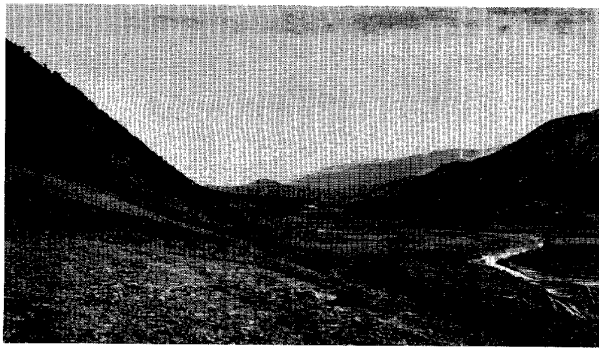


FIGURE II - 22. Eastern Coast Lowlands and Hills Region. Valley and road near Soch'ang, between Ulsan and Pusan. The road ascends two successive terraces, center. The valley is open, but the valley sides are steep. March 1901.

Marsh areas are small and relatively few in number. There are several large salt or brackish lakes and ponds short distances inland from the coast. Numerous lagoons parallel the beaches along the coast.

(c) *Soil trafficability* (FIGURE II - 83). Most of the soils north of  $37^{\circ}\text{N}$  in this area are well drained, coarse-textured types. South of  $37^{\circ}\text{N}$  there is more variation in soil textural types from place to place, and loams, clay loams, and clays cover considerable areas. There are numerous, but usually narrow, coastal strips of sandy soils which are trafficable at most places throughout the year. Areas of lowland rice paddies are relatively uncommon in the northern part of the area but are more common in the southern part. South of  $39^{\circ}\text{N}$ , many hill slopes are terraced and planted to wet rice (FIGURE II - 16). The paddy fields are flooded and nontrafficable from June through September.

The trafficability of nonpaddy soils in the north is most favorable from the middle of September through early November. In the south, where snows are very light and freezing and thawing of soil is infrequent, good trafficability conditions persist through the winter. North of  $39^{\circ}\text{N}$  there is usually a persistent snow cover during the winter, but it seldom accumulates to depths of a foot (FIGURES II - 16, II - 20). In the north the soil is usually frozen from the middle of December through February, but there may be periods of surface or total thaw. In the extreme north the streams and rivers are usually frozen over during January and February (FIGURE II - 8). During March and April widespread poor trafficability conditions prevail in most of the area as a result of abundant soil moisture provided by melting snows and thawing soil. These unfavorable conditions are much less severe in the south. During May and early June trafficability conditions of most soil types are generally favorable, but the lowland clays are frequently rendered slippery and muddy by light rains. Heavy and frequent rains during the season from late June through September result in periods of widespread poor trafficability; these conditions are most severe south of Wonsan.

(d) *Vegetation* (FIGURE II - 84). The East Coast Lowlands and Hills Region is moderately forested. In contrast to the extensive and open deforested areas of the west coast, the many hilly and mountainous sections along the east coast usually have partly forested slopes (FIGURE II - 12). Cultivation is concentrated in the numerous coastal lowlands, on the

valley floors, and, to a lesser extent on bordering slopes (FIGURES II - 16, II - 18).

Military operations within the region would be aided but little, or would even be affected adversely by the vegetative cover in some sections. Concealment is available in varying amount in many places (FIGURE II - 10). Passage across the flat coastal lowlands and over the valley floors would be hindered by the flooded rice paddies during summer. The irrigated fields have no definite pattern or plan as is found on the west coast (FIGURE II - 16). Numerous sand dunes along the coast are partly covered with patches of grass and shrubs.

Many small alluvial plains along the coast are intensively cultivated (FIGURES II - 8, II - 20). There is no double cropping in the northern half of the coastal section and only a few winter crops are grown in the southern section. In the northern section, millet rather than rice is the dominant grain; barley, oats, and potatoes are also important. Here the proportion of land under cultivation is relatively small. Ground observation is good across the gently sloping lowlands and is not usually limited by the low growing crops (FIGURES II - 6, II - 18), but fields of millet or other grains provide some concealment. South of Wonsan rice is the dominant crop, but dry-field subsistence crops such as potatoes and millet are produced. Barley and wheat are winter crops.

The hills and headlands which separate the coastal lowlands are partially covered with grass, and scattered trees and scrub. In places where the slopes are almost barren, extensive erosion has resulted. Several of the larger valleys north of  $39^{\circ}\text{N}$  are quite barren in many places. Patches of forests cover the higher elevations. Farther inland, the barren gravelly valley floors are in marked contrast to the densely forested bordering slopes of the eastern Korean mountain ranges (FIGURES II - 8 and II - 20). Here the forests are mixed broadleaf and conifer with red pine and oak as predominant tree types. Fire fields are not extensive within the region, though burned over areas are present in the northeastern and southeastern sections. Many of the small coastal stream valleys to the south are more heavily forested, and observation is restricted in most localities (FIGURES II - 8 and II - 22).

### (3) *Region 3. Northern Korean Highlands* (FIGURES II - 79 to II - 84; PLANS 4 to 8, and 48 to 51; ROUTE SUPPLEMENT FIGURES RS-5 and RS-6).

Most of this region consists of rugged hills or mountains, but one subregion, the Kaima Plateau, contains extensive flattish upland areas. The region is drained by the upper reaches of the Amnok-kang and the Tuman-gang and their northward-flowing tributaries, but includes also the rugged terrain near the headwaters of southward- and eastward-flowing streams. The region extends about 330 miles from the Tuman Valley in the northeast to the lower end of the Sup'ung reservoir on the Amnok in the southwest, and is from 30 to 100 miles wide, north-south. This is one of the more densely forested areas of Korea.

(a) *Relief and subregional delineation* (FIGURES II - 79 to II - 82). The Northern Korean Highlands are a continuation of the mountains of southern Manchuria. Most of the natural and political boundary between Manchuria and Korea follows the Amnok-kang and the Tuman-gang. These two rivers rise near Paektu-san (Hakutō-san) (mountain) (FIGURE II - 23), 8,990 feet elevation, and flow generally westward

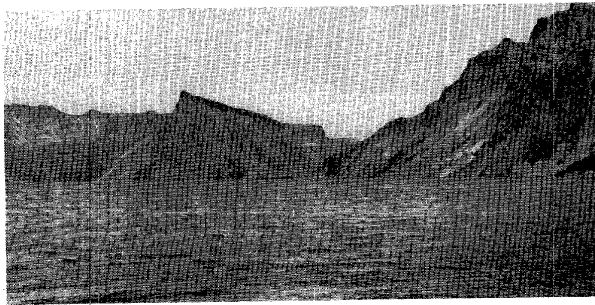


FIGURE II - 23. Northern Korean Highlands Region. Paektu-san. App. 42°00'N, 128°03'E.

The crater of the inactive volcano, Paektu-san, contains a lake about 2 miles across. The crater sides are rugged and steep. 1912.

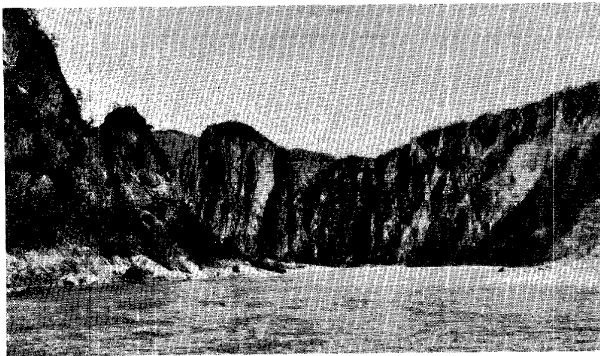


FIGURE II - 24. Northern Korean Highlands Region, near Chunggangjin, on the upper Amnok-kang. App. 41°45'N, 126°50'E. A gorge on the upper Amnok. Much of the upper Amnok is lined by rocks and cliffs. Before 1931.

and eastward, respectively. Except for short stretches, the valleys and stream beds of their upper courses and of their tributaries are rocky and narrow (FIGURE II - 24) with steep, partially forested valley sides (FIGURES II - 25, II - 26, and II - 27). Downstream the valleys widen, but are dominated by steep, forested hills and mountains (FIGURES II - 28, II - 29, and II - 30). In this region the Amnok falls from about 6,500 feet at its source to below 330 feet at the Sup'ung reservoir, a distance of about 250 miles. The Tuman falls from almost 4,000 feet at its source to about 330 feet at the beginning of the Tuman Valley Region, a distance of about 120 miles.

There are 4 terrain subregions within the Northern Korean Highlands. These are described in turn, from east to west, below:

1. EASTERN HILLS AND MOUNTAINS; SUBREGION 3a. The terrain east of Hoeryong (Kainei) is lower and less rugged than in most of the Northern Korean Highlands. It consists of steep, forested hills and mountains, 1,000 to 3,500 feet high, and the generally mile-wide, flat, winding tributary valleys of the Tuman.

Terrain conditions in the Eastern Hills and Mountains subregion are generally similar to those shown near Hoeryong (FIGURE II - 88). Throughout the subregion the northward-flowing upper Tuman has a valley about a mile wide, but every 5 to 10 miles the hills close in upon the river, forming a narrow gorge. In the wider portions, the valley floor is nearly flat and covered with crops, grass, or woodland (FIGURES II - 25 and II - 29). In the gorges, cliffs rise directly from the river. Most



FIGURE II - 25. Northern Korean Highlands Region. Chunggangjin, on the upper Amnok-kang. App. 41°45'N, 126°50'E.

The Amnok flows southwestward past this town, which is on a one mile-wide valley plain, commanded by 1,300-foot hills. Note steep bluffs on outer side of bend and gentle slopes on inner side of bend.

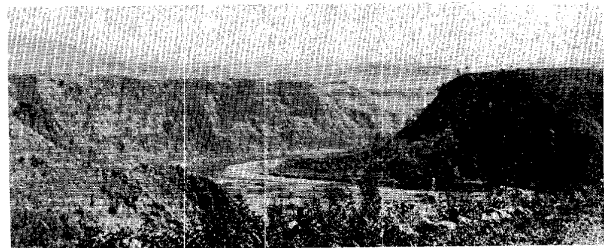


FIGURE II - 26. Northern Korean Highlands Region, near Musan, upper Tuman-gang. App. 42°20'N, 129°20'E.

In many places, the Tuman flows through a gorge cut below a larger valley flat. The river is winding and stony. 1912.

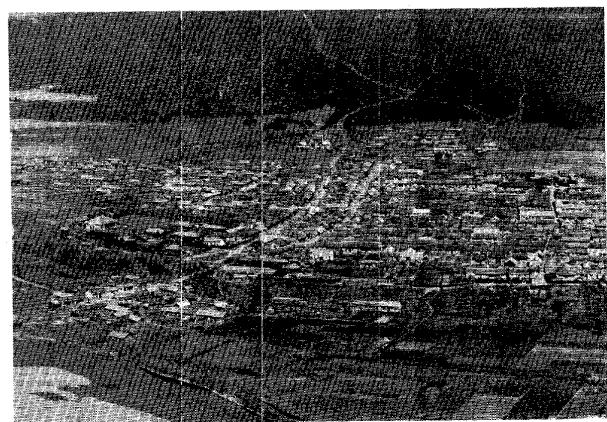


FIGURE II - 27. Northern Korean Highlands Region. Hyesanjin, on the upper Amnok-kang. App. 41°25'N, 128°10'E.

Looking southward, across the Amnok toward the Korean town of Hyesanjin. The valley here is flat, and commanded by steep hills. A steep bank borders the stream, and a low bluff separates two valley levels.

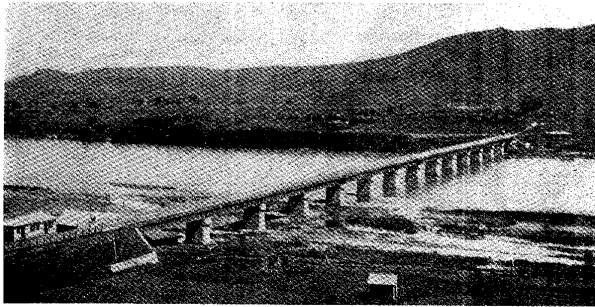


FIGURE II - 28. Northern Korean Highlands Region.  
Sangsambong.  $42^{\circ}45'N$ ,  $129^{\circ}45'E$ .

Looking across the upper Tuman toward Korea and the village of Sangsambong, about 20 miles N of Hoeryong. Before 1931.



FIGURE II - 29. Northern Korean Highlands Region. Near Musan,  
upper Tuman-gang. App.  $42^{\circ}20'N$ ,  $129^{\circ}20'E$ .

The valley of the Tuman widens where the tributary Songch'on-su enters from the SE. The stream in foreground is entrenched below the general level of the valley plain. 1912.



FIGURE II - 30. Northern Korean Highlands Region. Near Huich'on. App.  $40^{\circ}10'N$ ,  $126^{\circ}15'E$ .  
Partly barren river flood plains are typical in many parts of Korea. June 1930.

settlements are located at stream junctions. For example, Hoeryong (FIGURE II - 88) is situated on a flat valley area about 3 by 2 miles in extent at the junction of a small tributary with the Tuman. The town is situated about  $\frac{1}{2}$  mile away from, and about 50 feet above, the Tuman. Both road and railroad follow the higher part of the valley floor, near the hills. Grass- or forest-covered hills rise steeply from the tributary streams. Summit elevations are from 2,000 to 3,500 feet (FIGURE II - 82). Numerous small swift streams flow out of the hills. Small villages and scattered dwellings are found along these streams, mostly on the higher, less flooded parts of the valleys. Soils in the wider parts of the valleys are sand, gravel, or clay. Soils in the hills and mountains are dark colored and well drained. The underlying rocks are granites, shale, sandstone, and conglomerate. Except during spring and summer floods and in winter snow, terrain conditions favor movement by foot troops and locally by vehicles in the larger valleys. Throughout the year, terrain conditions in the hills and mountains are unfavorable to movement by foot troops or vehicles. The steep slopes, cliffs, and forest cover of this section, as well as the winter snow, spring floods, and summer rains, practically prohibit cross-country vehicle movement.

2. KAIMA PLATEAU; SUBREGION 3b. The Kaima Plateau extends westward from the Eastern Hills and Mountains subregion nearly to the 128th meridian. In the Kaima Plateau, east and southeast of Hyesanjin and at elevations of

4,000 to 6,500 feet, are extensive areas of nearly flat, mostly grass-covered upland, the largest 15 by 50 miles (FIGURE II - 81). On these flat uplands are some marshy areas, 1 to 2 miles in extent. Viewed from the surface of these flat upland areas, the skyline is apparently flat for tens of miles, but actually there are many deep, forested valleys cut into the surface.

Representative terrain conditions in the Kaima Plateau subregion are shown on FIGURE II - 89. The most conspicuous features are the extensive areas of gently sloping, grass- or tree-covered upland, separated by steep, rugged valleys (FIGURE II - 13). The surfaces of the larger uplands slope gently from grassy summits at about 6,500 feet elevation to about 4,600 feet elevation at their lower edges. Steep slopes descend from these uplands 2,300 feet in a mile to the gorge-like valleys below. These slopes are grass or forest covered, with cliffs in many places. Smaller uplands are a mile or more in extent and slope about 165 feet in a mile. Rounded ridges of moderate slope connect some flat uplands with each other; other uplands may be set off by steep slopes. There are some mountains included in the Kaima Plateau subregion, with either sharp or rounded summits. Summit elevations are about the same as in the flat areas, 5,000 to 6,500 feet.

Soils in this area are mostly well drained and dark colored, often reddish. The underlying rocks are slate, sandstone, and limestone.



FIGURE II-31. Northern Korean Highlands Region. Near Kanggye. App. 40°55'N, 126°35'E. Looking N across the Amnok-kang into Manchuria. Hills and mountains are partly forested and are covered with snow. Passes between valleys are narrow and difficult. December 1944.

The flat surfaces of the uplands are trafficable for foot troops and vehicles. Most of the approaches to these uplands, however, are over terrain difficult for movement on foot and very unfavorable for vehicles. The stream valleys provide interrupted routes for movement. Their winding courses have small areas with flat valley floors, 1 to 2 miles long and ¼ mile wide. These are interrupted by stretches where cliffs rise directly up from the river. Movement locally within the region may be readily possible, but large scale operations through the whole Kaima Plateau will be extremely difficult.

3. YANGNIM RANGE; SUBREGION 3c. Southwest of the Kaima Plateau is the highest (7,000 to 8,000 feet), most rugged, and inaccessible part of the Northern Korean Highlands, the Yangnim Range. The streams flow in gorges, or in steep-sided, forested valleys. The passes at the heads of the valleys on the north-south routes are at elevations of 3,300 feet or higher. Valley and mountain slopes are mostly steep (FIGURE II-81). Flat, marshy areas a mile wide are found south of the 2 large reservoirs, Pujon and Changjin. In contrast to the flattish upland areas of the Kaima Plateau, the

summits in this subregion are sharp or rounded. Forests extend to 7,500 feet on some peaks. Above this elevation the mountains have grass or bare rock.

Much terrain in the Yangnim Range subregion is similar to that shown in FIGURE II-90. The high, rugged Yangnim Range is characterized by steep, grass- or forest-covered slopes, gorge-like interruptions in the stream valleys, and cliffs scattered along the mountain slopes. Narrow (5- to 6-mile) stretches of moderately sloping ridge tops are locally favorable for movement. The section shown in FIGURE II-90 is a wilderness of ridges and peaks from 5,500 to 8,100 feet high, mostly covered with thick forest. It is drained by rapid, winding streams, which flow for some stretches in valleys 300 to 400 yards wide, and in other stretches flow between sheer cliffs rising from the streams. This subregion is sparsely inhabited. Only two or three roads cross it, and no railroads cross it completely. The terrain favors local, small-scale movement only; large-scale cross-country operations are practically impossible.

Restricted

MILITARY GEOGRAPHY

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4. P'YONGAN-PUKTO HILLS AND MOUNTAINS; SUB-REGION 4d. The western part of the Northern Korean Highland Region is lower, but almost as rugged and as heavily forested as the Yangnim Range. Summit elevations are from 2,900 to 5,500 feet (FIGURE II-82), but slopes are mostly steep, (FIGURE II-81) and forests cover parts of the mountains. The elevations of passes on main routes through this area are 1,600 to 2,300 feet. The stream valleys are very winding and narrow (FIGURE II-31). Valley floors may be flat and a mile wide in places, but are generally confined to narrow gorges 200 or 300 yards wide. The approaches to passes are very steep. Foot troops can move in the river valleys, but will be hampered by many stream crossings, stony valley floors, deep snow in winter, and floods in spring and summer (FIGURE II-31). The terrain favors vehicular movement in the larger valleys, but gorges, steep slopes, and heavy forest cover prohibit cross-country traffic in most of the Northern Korean Highland Region (FIGURES II-13 and II-19).

Representative terrain conditions in the P'yongan-pukto Hills and Mountains subregion are shown in FIGURE II-91. Except for lower summit elevations (2,200 to 3,500 feet) and fewer gorges along the streams, the terrain is similar to that of the Yangnim Range subregion to the east. The hills and mountains have steep, grass- or forest-covered slopes. Ridge tops have narrow 1- to 3-mile-long stretches of moderate slope. Stream valleys are winding; they are 200 to 500 yards wide for 2 to 5 miles, then are restricted to narrow, 30 to 100 yard wide gorges. Valley floors are planted to rice or have grass or trees. Narrow belts along the streams are cobbly and have scattered boulders. The Amnok-kang, along the northern boundary, backs up behind the Sup'ung dam (approximately 40°29'N, 124°55'E) forming a large reservoir, 1 to 3 miles wide and about 65 miles long. Although ordinarily frozen across in winter, it forms a considerable obstacle to land movement in spring, summer and fall. The largest tributary of the Amnok in the area shown in FIGURE II-91 is the Ch'ungman-gang, which winds northwestward across nearly all of the subregion, and empties into the Sup'ung reservoir. Its gorge-lined, winding course does not favor large-scale operations, and no major road or rail route uses its valley.

Soils in this subregion are dark colored, mostly reddish, and well drained. Burned-over areas, called fire fields (*kaden*), are bare and are generally light-colored (FIGURE II-32).

Movement is almost as difficult in this subregion as in the Yangnim Range subregion.

5. ROUTES IN THE NORTHERN KOREAN HIGHLANDS. The upper sections of the Amnok-kang and Tuman-gang provide poor, winding routes inland. The most favorable terrain along these rivers is included in the Lower Amnok Valley (Region 11) and the Lower Tuman Valley (Region 1), respectively. Existing east - west routes are poor, and are suitable only for small-scale, local operations. The best routes through the region are north - south.

Five north - south roads are of particular significance (FIGURE II-79). The southern termini of these routes are not in the Northern Korean Highlands.

a. ROUTE B-1. This route, from Ch'ongjin to Hoeryong, is about 55 miles long. The first 25-mile section follows the Susong-ch'on Valley, and has maximum elevations of about 660 feet. The route then ascends rapidly to a pass at

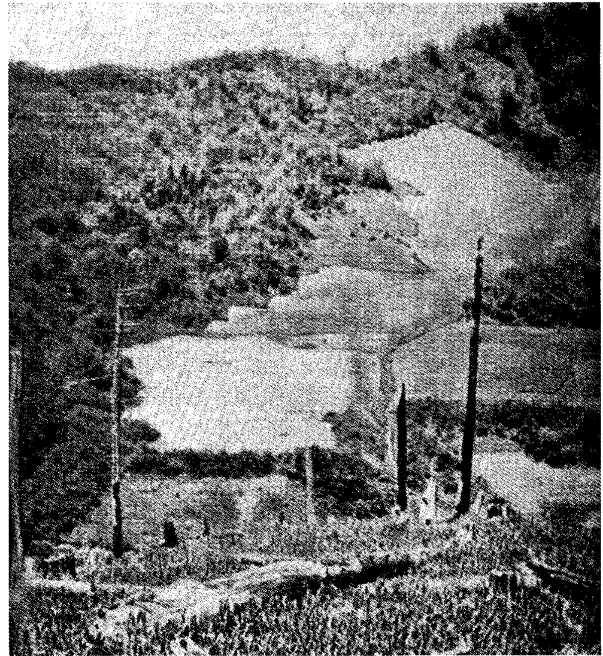


FIGURE II-32. Northern Korean Highlands Region. Fire fields. Primary clearing not far from the Chunggangjin - Chasong highway, app. 41°30'N, 126°40'E. Charred remains of tree trunks in foreground. Abandoned fields in the distance. Before 1941.

2,300 feet. The remaining 25 miles pass through the steep-sided, narrow valley of the Hoeryong-ch'on, to its junction with the Tuman (FIGURE II-88). Rugged terrain and frequent stream crossings will hinder movement.

b. ROUTE C-1. This route, from Songjin to Musan, is about 125 miles long. The first 25-mile section is in the valley of the Namdae-ch'on (FIGURE II-13) and other streams, less than 660 feet above sea level. The rest of the route is in the high, rugged Kaima Plateau and crosses a 5,800-foot pass, but follows winding, narrow stream valleys part way.

c. ROUTE C-2. The Songjin - Hyesanjin route (C-2) is about 80 miles long. The first 20-mile section is in a small stream valley, with elevations below 660 feet (FIGURE II-13). The rest of the route crosses the Kaima Plateau, but follows steep, narrow valleys part way (FIGURE II-23). In some sections, movement off established routes is difficult or impossible. The highest pass on this route is 5,900 feet above sea level. On either side of this pass, gently sloping uplands extend for 10 miles or more, offering possibilities for movement or deployment. The northern terminus of the route is at the junction of the Unch'ong-ch'on with the Amnok (FIGURES II-27, and II-28).

d. ROUTE C-3. This route, from Hamhung to Sin'galp'ajin is about 135 miles long. The first 15-mile section follows the valley of the Songch'on-gang, at elevations below 660 feet (FIGURE II-20). The route then climbs to a 3,900-foot pass and crosses the rugged Yangnim Range. East of the Changjin reservoir it reaches its greatest elevation, 4,590 feet. North of the reservoir it descends the winding, narrow valley of the Changjin-gang to its junction with the Amnok at Sin'galp'ajin.

c. ROUTE C-4. The Anju - Manp'ojin route (C-4) is about 125 miles long. For 40 miles this route leads up the mile-wide valley of the Ch'ongch'on-gang (Seisen-kō) (FIGURE II-30). From this valley the route ascends steeply to a 2,300-foot pass, then descends steeply to the valley of the Tongno-gang which it follows to Kanggye (Kōkai). About 15 miles beyond Kanggye the road and railroad utilizing this route leave the valley, and cross a ridge which rises about 350 feet above the valley, to Manp'ojin on the Amnok-kang (FIGURE II-31).

6. IMPORTANT AREAS. Because movement off established roads is so difficult in this region, the most significant areas in the Northern Korean Highlands are the routes through to the Manchurian border, described briefly above, and the Sup'ung dam on the Amnok. From the point of view of access to or from Manchuria, the Ch'ongjin - Hoeryong route (B-1) is probably the most important.

(b) *Drainage* (FIGURE II-80). This region is drained by the northward-flowing tributaries and the upper reaches of the Amnok and the Tuman, and by the headwaters of streams flowing southward and eastward to the east coast. In addition to the Amnok-kang and the Tuman-gang, other major streams within the highland area are the Hoeryong-ch'on, the Sodu-su, Hoch'on-gang, Tongno-gang, and the Changjin-gang. The largest tributary streams are more than 50 miles long; numerous smaller streams, 1 to 5 miles long, drain the marginal highland slopes. The streams of the Northern Korean Highlands are entrenched in deep, narrow, winding valleys (FIGURE II-22). The stream network throughout the highlands is dense; the water courses are seldom more than 3 to 5 miles apart. There is one exception, near Paektu-san in the extreme upper sections of the Amnok-kang and the Tuman-gang, where the tributary streams are 10 to 15 miles apart. The Tuman-gang and Amnok-kang are described in connection with Region 1 and Region 11; the discussion below is confined largely to tributary streams.

In general, the rivers of this region have similar characteristics. The stream beds are of 3 kinds: (1) solid rock bottom with great variation in current, (2) rapids filled with boulders, and (3) intermediate sections of rocks, gravel and sand. Relatively few stream bed sections are of mud. Small tributaries have local muddy areas along the banks, but the beds of the rivers have little mud.

Flood stage is in July, during the rainy season. Flash floods occur frequently. The heavy rains are usually local. Thus only one or two tributaries are in flood at once. When the streams are in flood, the banks are sometimes torn out completely, and wherever there is an obstruction to the current, sand, gravel, rocks, and driftwood are dropped. Where the hills are largely denuded of forest, the streams rise rapidly during and after heavy rains. It is recorded that the Tongno-gang has risen 25 feet in 5 hours, but this is probably an extreme occurrence.

There are no wide flood plains; many stream valley bottoms are V-shaped (FIGURES II-22, II-24, and II-25). As is true in many mountainous regions, the streams here are restricted in places by barriers of solid rock. There are few falls, but rapids are very numerous, and the current is usually quite swift. Between these rapids the rivers are wider and the current slower (FIGURES II-25 and II-28).

Stream depths average 3 to 6 feet, except during floods. Streams are generally fordable and are frozen in winter. Widths range from 20 to 250 yards. The Tongno-gang is one of the larger and wider Amnok tributaries draining the western slopes of the highlands; at Kanggye, it is about 175 yards wide. Sixty miles downstream, at its mouth, it is about 250 yards wide.

Many of the stream banks are undercut, and fallen banks are common. The banks are usually of sand and gravel with numerous rocks and boulders along side of the bank. The banks are low (probably 5 to 10 feet) except where the stream course is bordered by steep cliffs or bluffs over 100 feet high (FIGURE II-24). In many places the banks are covered with grass; patches of trees, and bushes loaded down with driftwood, are common (FIGURE II-26).

Islands of various sizes are scattered irregularly along the courses of the larger streams (FIGURE II-25). These islands (sand, gravel, rocks) are usually covered with patches of grass and willows.

(c) *Soil trafficability* (FIGURE II-83). In this region, mountain land and other rough lands of permanently poor trafficability predominate, and favorable terrain is restricted for the most part to discontinuous narrow valley lowlands (FIGURE II-22). The predominant soils in the lowlands are sandy loams and loams, many of them peaty types which dry slowly. Marshlands are more numerous in this region than they are in other parts of Korea. Rice paddy fields occur only in small isolated areas, and are flooded and nontrafficable from June through September.

The trafficability of nonpaddy soils is most favorable from mid-September through early November. A snow cover is usually established at most places during the middle of November, and is deeper and more persistent than in other areas (FIGURE II-31). The depth of snow cover, where not drifted, seldom exceeds 18 inches in valley lowlands, although drifts of 3 feet are not unusual. Soil freezing usually becomes persistent during November and aids trafficability where the snow cover is light. The streams and rivers generally freeze over during the first part of December. At Chunggangjin (FIGURE II-25) the average freezing date of the Amnok-kang is December 17, the earliest freezing recorded was December 5, and the latest was January 5. During March and April, the soils are saturated by melting snows and thawing soil; wheeled vehicles will mire almost everywhere off the improved roads. The Amnok is usually ice-free by April 5. Trafficability is improved during May and early June. From late June through mid-September, heavy rains cause fairly frequent periods of widespread poor trafficability, and persistent light rains cause the lowland clays to be muddy and slippery most of the time. The summer periods of poor trafficability occur less often and are less severe in the northeast than in other parts of the region.

(d) *Vegetation* (FIGURE II-84). This region has the most extensive forest lands in Korea. This is one of the few regions with anything resembling a natural forest, yet even here the actual forested areas are spotty and discontinuous, and are situated mainly in the mountains which surround the Kaima Plateau.

In contrast to the deforested and open valleys of western and southern Korea many of the highland valleys are densely forested with a thick undergrowth, which provides concealment. The valleys of the upper Amnok-kang and the Tuman-

gang are heavily wooded and very difficult to penetrate. The Northern Korean Highlands are sparsely cultivated and generally lack the wide barren valleys that characterize the western and southern regions of the peninsula.

The natural vegetation of the region is largely of 3 types: (1) mixed broadleaf and coniferous forest, (2) predominantly broadleaf forest, and (3) scrub and grass. Within each natural forest type there are extensive areas of scrubby second growth and grassland, particularly on the Kaima Plateau. There are also many open places at higher levels, with either barren rock surface or scrub. The largest areas of broadleaf forest include most of the P'yongan-pukto Hills and Mountains subregion and a narrow belt parallel to the coast on the eastern margin of the region. The central and eastern parts of the Northern Korean Highlands are largely mixed forest and grasslands.

1. MIXED BROADLEAF-CONIFEROUS FOREST. Intermingled with broadleaf species are extensive coniferous forests. This subtopic confines itself largely to a description of the conifers; the broadleaf species are discussed in the next subtopic below. Red pine, larch, nut pine, and mountain fir are the chief coniferous species. They either grow together or form more or less pure stands (FIGURE II-33). The wood is generally of good quality. Nut pine and mountain fir are associated with both broadleaf and coniferous trees. The largest of the Korean larches are over 100 feet tall, and have trunks 2 to 3 feet thick, but such trees are unusual and probably are found only in this region (FIGURE II-33). The larch loses its needles



FIGURE II-33. Northern Korean Highlands Region.  
Larch forest near Paektu-san.  
Forest of 180-year-old larch trees, averaging 120 feet  
high and 1½ feet in diameter. Before 1931.

in winter and its trunk is normally clear of branches for a considerable distance from the ground, thus making the larch forests thin, open, and parklike. There is some undergrowth, such as shrubs and blueberry bushes.

There are great local variations in passability of mixed forests in the region, depending on the conditions of the undergrowth and the ground. Generally, passability increases at higher elevations, because there is less undergrowth. Where secondary forests are in advanced stages of development, however, they are difficult to penetrate. Original forests also are difficult to penetrate because of the abundance of tree trunks and limbs which are richly covered with twining plants. This type of forest surrounds Paektu-san for a considerable distance.

Not far from the upper elevational limit of tree growth (about 6,000 feet), the trees are not only low and deformed, but the composition of the forest also changes. The vegetation type varies according to location; it may consist of dwarf bush meadow, or dwarf willow, or small alpine bush, or low rhododendron.

The most important of the conifers are the red pines found throughout the entire peninsula. In the Northern Korean Highlands they are about 75 feet tall with trunks from 3 to 4 feet thick. The Korean nut pine is a very common tree on the mountains; it is 80 feet tall, with trunks about 3 feet thick. Creeping pine clothes the upper slopes and summits of most of the higher peaks northward from about 38°30'N, except on Paektu-san, from which it is entirely absent. The Korean fir also is very common. It grows 90 feet tall with trunks about 3½ feet thick. A flat-leaf spruce grows throughout the Northern Korean Highlands (especially in the northeast) and at high elevations as far south as Chiri-san in the Naktong-gang Basin and Hills (Region 7). It grows to 90 feet with a trunk about 3 feet thick. A species of the juniper tree is very common, especially in open country and in thin woods of red pine or oak. A fir tree of little value as a timber tree but used for garden purposes grows in moderately open country where the soil is rich and moist. The branches are moderately strong and spreading, and would provide concealment and places for observation.

2. BROADLEAF FOREST. The most extensive forests of deciduous broadleaf trees are on the P'yongan-pukto Hills and Mountains. In general, Korean broadleaf trees are small. The largest is a poplar, sometimes 100 feet tall with a trunk 6 feet through. Other important trees are the Mongolian oak, 60 feet tall and 2 feet thick; a maple about 80 feet high with a very straight trunk; and an elm 75 feet tall and 3½ feet thick. In the open country, especially by river sides and in swamps, are abundant bushes or low trees of irregular shape. The Korean mountain pear is usually found by the side of streams or on the edge of the forest. These trees are about 30 feet tall and 2 feet thick.

The broadleaf forests have a dense undergrowth in contrast to the thin undergrowth of the mixed forests. Most abundant types in the undergrowth are the azalea, rose, magnolia, honeysuckle, lilac, forsythia, and spiraea. Willows are abundant in rocky stream beds which are flooded only by summer torrents, and on the banks of year round streams. Woody plants grow on the barest and most rocky hills and mountain slopes. Pear, crab apple, wild cherry, apricot, and other flowering trees grow along river banks, the edge of the forest, and in the

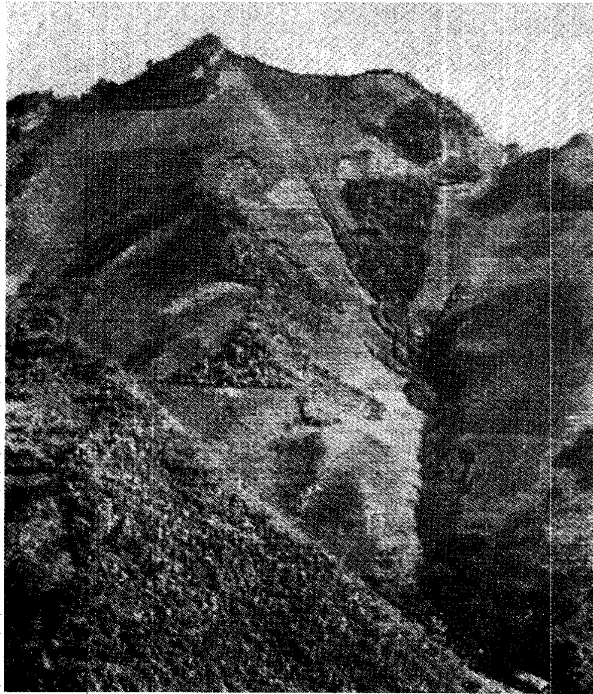


FIGURE II - 34. Northern Korean Highlands Region. Fire fields. Very steep fire fields on a pass between Wiwon and Ch'osan, app.  $40^{\circ}50'N$ ,  $126^{\circ}00'E$ . Slope is about 60 degrees. Before 1941.

open country. Movement is very difficult in the broadleaf forest areas. Concealment is aided by the dense undergrowth, and observation is limited to a few yards except in the occasional thinner or open patches.

3. SCRUB AND GRASSLAND. Extensive areas of scrub and grassland are intermingled with both the mixed forest and the broadleaf forest. Large areas of scrub and grassland have developed in abandoned fire fields (*kaden*) and in cut over lands left idle after commercial lumbering.

Fire fields are more extensive in the Northern Korean Highlands than any other region of Korea, and include not only large parts of the Kaima Plateau but also numerous openings in the forests of the mountains. There are farms in fire cleared areas at elevations of 4,650 feet on the highway from Kapsan (Kozan) to P'ungsan (Hozan). The uppermost fire-cleared fields on the watershed between the Amnok-kang and the coastal rivers draining to the Sea of Japan are at altitudes of 4,500 to 5,500 feet. The fire-cleared fields extend high into the coniferous forests on the Kaima Plateau. They are found on slopes of 40 to 60 and even 70 degrees (FIGURE II - 34). The fields are burned in the fall when the rainy season is almost over (September or October), and also in the spring. The trees seldom burn to the roots; stumps are left standing, and the thicker the trees, the higher are the stumps left (FIGURE II - 35). Usually the stumps are 3 to 9 feet high, but some charred trunks are 30 feet tall. In some places, when the land is being used for the first time, about half the forest is left standing.

When the field is abandoned it becomes thick with bushes and weeds; if the field is not eroded too much, there is soon a scrubby secondary forest (FIGURE II - 36). The bushes are

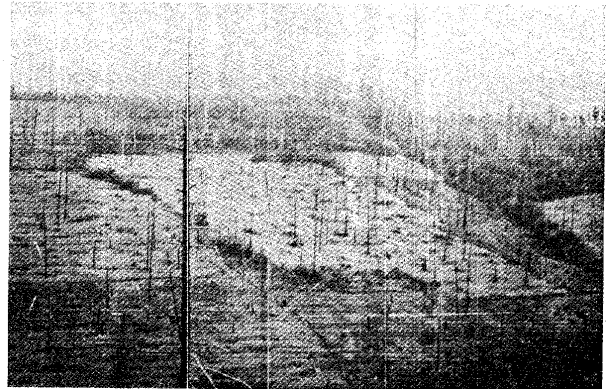


FIGURE II - 35. Northern Korean Highlands Region. Fire fields. Stumps and half burned trunks from primary forest. Fields planted to buckwheat, oats and potatoes. Unused fields in distance and in foreground. Before 1941.

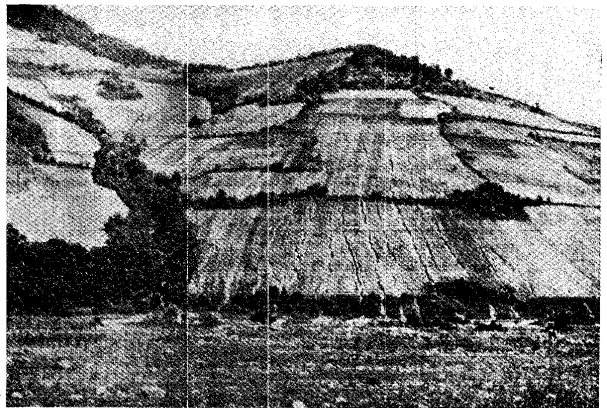


FIGURE II - 36. Northern Korean Highlands Region. Fire fields. Erosion gullies in fire fields. Secondary bushes on hilltops, near water courses (left), and between fields. Stones brought by high water cover valley flat in foreground. Before 1941.

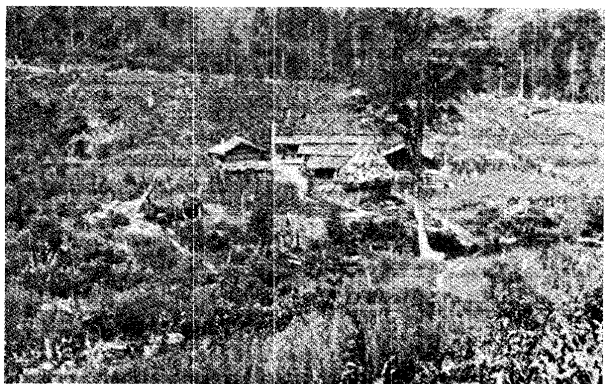


FIGURE II - 37. Northern Korean Highlands Region. Fire fields. Primary clearing in forest north of Huch'ang, app.  $41^{\circ}20'N$ ,  $127^{\circ}05'E$ . Mixed forest in distance. Cultivated fields in middle ground. In foreground, millet and sesame, with weeds. Before 1941.

sometimes higher than a man's head and provide concealment. Vegetation types in abandoned fire fields vary according to altitude and locality. On the burned fields of Tetsu-o-san, in the district of Musan at altitudes of 900 to 3,000 feet, are saplings of the linden, maple, Chinese birch, and trembling poplar, as well as lilac and spiraea. At 3,600 feet are oak, rhododendron, and lespedesa. These are interspersed with grasses and weeds (FIGURE II - 37). In winter the fields stand out as rectangular white spots on a gray background; in spring, brown on a green background (FIGURE II - 32). Field colors in summer and fall vary according to the crop and stage of advancement, and include bright green, greenish-white, yellow, yellowish-brown, and wine-red.

4. **CULTIVATED LAND.** The Northern Korean Highlands are sparsely cultivated. There is little double cropping. Millet, barley, oats, and wheat are the dominant grains. Potatoes are also grown. Dry fields occupy both slope and valley sites, although there is some rice in the valleys and on the small overflow plains. Local varieties of rice are harvested at the end of September. Individual fields are not intensively cultivated. Stony and badly kept fire fields, furrowed by erosion, extend high up the steep slopes (FIGURE II - 36). Millet, maize, hemp, barley, soybeans and other beans, quick growing plants, especially buckwheat, (FIGURE II - 35) grow on the uppermost fields which extend up to 1,800 to 5,500 feet. Plants such as buckwheat, sesame, and beans that need plenty of sunshine are planted within the fields in strips 2 to 6 feet broad. High-stalked plants such as maize, sorghum, and millet are often planted as borders around the fields. Hemp is often grown in solid stands, and part of it is harvested in July or August. Buckwheat is then planted in the same field although the remaining hemp stalks stand 2½ months longer to produce grain and rope fiber.

(4) **Region 4. Northern Taebaek Range** (FIGURES II - 79 to II - 84; PLANS 8 to 10; ROUTE SUPPLEMENT FIGURES RS-5, RS-13, and RS-16).

The Northern Taebaek Range is a region of moderately high, rugged mountains and hills situated between the Northern Korean Highlands on the north and the Wonsan - Seoul Corridor on the south; and between the East Coast Lowlands and Hills and the Western Lowlands and Hills on the east and west respectively. The northern boundary of the region lies between the northward-flowing streams of the Northern Korean Highlands and the generally southward-flowing streams of the Taebaek. The eastern and western borders of this region are arbitrarily placed to include the rugged terrain near the upper reaches of east-flowing and west-flowing streams. The region extends about 140 miles north - south and about 50 miles east - west. It is rugged, partly forested, and well drained, but is lacking in settlement and in transportation routes.

(a) **Relief.** The terrain consists of very steep, cliffed hills and ridges, generally 1,500 to 5,000 feet high, which dominate winding gorges and valleys (FIGURE II - 38). Most of the ridges are oriented north - south, but the valleys extend in all directions. Many streams flow across the dominant trend of the ranges. Summit elevations are highest in the north (3,500 to 6,000 feet), and lowest in the west (1,600 to 3,500 feet). Summits are generally rounded but are set apart by cliffs or steep slopes. The streams wind through gorges or steep-

sided valleys which are 500 to 1,000 feet deep. In their upper parts the larger rivers such as the Ch'ongch'on-gang, the Taedong-gang, the Yesong-gang and the Imjin-gang, flow in narrow, steep-sided valleys or gorges, providing no room for extensive movement or deployment (FIGURE II - 38). Only locally, between ridges, do the valley floors widen to form basins, ¼ mile to ½ mile wide. Soils in the valleys are mostly gravel. On the hill and mountain slopes, soils are mostly dark colored, probably reddish, and well drained. The highest summits have much bare rock (FIGURE II - 38). Operations on established routes will be hampered by narrow, winding roads, steep passes 2,000 to 3,600 feet high, deep snow in winter and heavy rains in summer. Movement away from the roads will be difficult even for foot troops and very difficult or impossible for vehicles.



FIGURE II - 38. Northern Taebaek Range Region.

App. 40°02'N, 126°20'E.

Rugged partly forested mountains and narrow, flat-floored, winding valleys, with relatively little water in stream bed. Before 1931.

1. **ROUTES.** No easy routes suitable for large-scale movement cross this region in any direction. The most favorable east - west passageway is by the Wonsan - P'yongyang road. (Route D-3 on FIGURE II - 79) This winding road climbs steeply out of Wonsan to a pass more than 2,300 feet high. From this pass, about 20 miles west of Wonsan, the route descends westward through gorges and steep-sided, winding tributary valleys of the Taedong-gang to Songch'on and P'yongyang. This route could be blocked easily and would not be suitable for heavy, two-way traffic, particularly during torrential summer rains. Three so-called "improved roads—over 12 feet" cross the region from east to west. These go from Chig-yong, near Hamhung, to Tokch'on and Anju (Route D-1 on FIGURE II - 79); from Yonghung to Unsan-ni and P'yongyang (Route D-2 on FIGURE II - 79); from Kumhwa on the Wonsan - Seoul road, across the Wonsan - Seoul Corridor and westward to Namch'onjom (Route D-4 on FIGURE II - 79). Highest points on these routes are about 3,400, 1,600, and 1,600 feet, respectively.

2. **IMPORTANT AREAS.** The most important areas of the Northern Taebaek Range are the more favorable crossings in the region, briefly described above.

(b) **Drainage** (FIGURE II - 80). The Northern Taebaek Range is well drained. The drainage divide between westward- and eastward-flowing streams lies within the eastern half of the peninsula. Deep stream valleys, such as those of the short rapid streams of the east coast and the headwaters of the Ch'ongch'on-

gang, Taedong-gang, Yesong-gang, and the Imjin-gang of the west coast are characteristic of these high ranges. The main streams have many tributaries. Slopes have deep gullies which complicate the pattern of the existing drainage systems (FIGURE II - 38).

Rivers and streams are shallow in their upper courses. Most of them are probably only 1 to 3 feet deep. They flow through deep channels, partly of rock and partly of unconsolidated, decomposed sandstones, limestone, and slates. Banks, of earth and rock, are generally firm enough to support the weight of men, but they crumble in times of flood and the rivers and streams carry large quantities of debris downstream. Banks of many of the waterways are moderately low (8 to 10 feet) in straight sections, but higher (over 20 feet) where the streams abut against hills. Flood plains are narrow, and are generally lacking along the short tributary streams. They are most common in the straight sections of large rivers, and are usually about 200 to 300 yards wide (FIGURE II - 38). The flood plains are of sand and gravel, either barren or sparsely covered with grass.

Streams are frozen 3 to 4 months during the year. Because of deep valleys, numerous bottlenecks, rocky channels, and torrential character in the rainy season, these streams and their valleys are of little value as routes.

(c) *Soil trafficability* (FIGURE II - 83). The terrain and soils of this area are similar to those of the Northern Korean Highlands, and the seasonal soil trafficability characteristics of the two areas are also similar. Periods of poor trafficability from mid-June through mid-September are more frequent and severe in the Northern Taebaek Range, however, than in most other parts of Korea.

(d) *Vegetation* (FIGURE II - 84). The vegetation of the Northern Taebaek Range is essentially forest on the higher ridges and scrub or grass on most of the intermediate slopes. There is little cultivation, excepting small patches in larger valleys and on higher small burned-over areas (FIGURE II - 37). Partial concealment for small groups of men would be available in most parts of the region. In some sections, the forests are thick enough to retard cross-country movement. The grass, although coarse, might provide limited forage. Supplies of fuel, and of timber for construction purposes are available.

There are many rocky and barren areas (FIGURE II - 38). Rock ledges and outcrops are numerous in many parts of the region, especially along the steep valley sides and on the rocky surface of the higher elevations.

1. **FOREST.** The forested areas of the Northern Taebaek Range are varied in composition and in general appearance and in their effects upon military operations. The 3 major types are: broadleaf, coniferous, and mixed broadleaf and coniferous. Mixed forest predominates; it commonly includes pine, fir, oak, and birch. Most mixed forest stands are moderately dense, with scattered underbrush, and would hamper military operations. The upper slopes of Kanan-san, 4,800 feet, (district of Koksan) are so thickly forested with oak, maple, and other trees, that it may require 1½ hours to go 1,500 feet.

The northwestern and north central parts of the Northern Taebaek Region are predominantly in broadleaf forest. Oak, birch, maple, elm, poplar, and hornbeam are common broadleaf trees. They grow on steep, rocky mountain slopes and, though not tall, usually have thick trunks. Shrubs and vines

form a dense undergrowth which makes penetration difficult. The foliage is thick and offers good concealment.

The conifers form small, widely scattered patches of needle-leaf trees on the higher elevations (about 5,000 feet). Pine, fir, and spruce are most common. The coniferous forests provide relatively dense shade. Movement is more difficult in spruce and fir, which branch near the ground, than in pine, which starts branching several feet from the ground. Fir and spruce have some underbrush, whereas forests of pure red pine have none at all. Concealment is good.

2. **GRASS AND SHRUB.** Grass and shrub are present over widely scattered areas throughout the region but there are no large expanses of uninterrupted grassland. Parts of the mixed broadleaf forest and coniferous forest are interspersed with large areas of grass and shrub consisting generally of patches of grass clad mountain slopes, fire fields, and high altitude alpine shrub zones on summits. Much of the grass interspersed with forest is coarse and only a few inches high, but the grass and weeds in the abandoned fire fields are 4 to 6 feet high (FIGURE II - 37). Grass and shrub areas on the mountain slopes generally lack concealment except locally for individual foot soldiers. The abandoned fire fields which have grown up with grass, weeds, and shrubs provide concealment for small groups of men. The seasonal foliage of the numerous shrubs such as lilac, forsythia and rhododendron on the grass-clad slopes provide both partial concealment and camouflage. Rock ledges, eroded hillsides, and deep depressions are generally barren of vegetation, and offer little or no concealment.

(5) *Region 5. Wonsan-Seoul Corridor* (FIGURES II - 79 to II - 84; PLANS 9 and 10; ROUTE SUPPLEMENT FIGURE RS-19).

This corridor consists of a high, narrow, winding depression between the Northern Taebaek Range and the Southern Taebaek Range. It contains two separate routes, one road and one rail, which connect the largest lowland of the east coast, at Wonsan, with the Western Lowlands Region near Seoul. The main road, however, does not follow the natural corridor throughout its length. The region trends north-north-east - south-southwest. Its length is some 60 miles; its width varies from about 3 miles at the north end, to about 20 miles in the middle, and about 12 miles at the south end. The actual usable width of the corridor routes, however, is from 100 yards to 5 miles. The southern end of the corridor opens onto the Western Lowlands and Hills Region about 50 miles northeast of Seoul.

(a) *Relief.* The northern end of the Wonsan - Seoul Corridor is 2 to 3 miles wide. The floor here is rolling, with grass, trees, or rice fields, and slopes up gradually to hills which rise steeply 500 to 1,300 feet above the floor. The streams flow northward in narrow winding gorges 100 to 300 feet deep. The railway and the main road follow this eastern part of the depression, climbing slowly from about 300 feet elevation near 39°N to about 600 feet near 38°50'N, at Yongjiwon-ni, where the depression becomes much narrower. At this point the main road swings eastward, but a narrow, secondary road continues southward in the corridor.

The narrowest part of the depression extends southward about 12 miles from Yongjiwon-ni (FIGURE II - 92). It is a very winding gorge, 100 to 200 yards wide at the bottom, and

generally about 1,500 feet deep. A few small streams enter from either side, but there is practically no room for deployment. The railroad and the narrow road wind through the gorge, crossing the river in numerous places. The railroad uses about a dozen tunnels. At about 1,800 feet elevation the floor of the depression contains a marsh, 3 miles long and 1 mile wide.

South of the gorge section, the route continues across rolling, grass covered terrain, similar to that at the northern end, but lacking small river gorges. At about 2,000 feet elevation, the railroad goes through two more tunnels and starts the descent toward Ch'orwon and Seoul. The depression here is about 3 miles wide, grass-covered, and lacks the deep, conspicuous gorge characteristic of the northern part. At P'yongyang (elevation about 1,150 feet), several roads and the railroad pass through a 1/2-mile-wide gap. Southward to Ch'orwon the railroad crosses flat or rolling country about 5 miles wide and about 1,000 feet in elevation. Much of this flat country is planted to rice, and has a network of canals and ditches as well as irrigation ponds. The larger streams are confined by dikes. Steep hills command this part of the valley, and rise 300 to 1,000 feet above the valley level.

The main road route turns southeastward near the village of Yongjiwon-ni. For about 6 miles the route crosses the rolling floor of the depression but in the next 2 miles the road climbs 1,300 feet out of the depression to a narrow, grassy pass at an elevation of nearly 2,300 feet. This is the highest elevation on the route. Hills 2,600 to 3,300 feet high dominate this pass. The descent to the south of the pass is steep for a mile, then the route gradually descends the narrow valley of a tributary of the Pukhan-gang. This valley is about 300 yards wide and commanded by hills with summits 300 to 1,200 feet above its floor. The road crosses the stream two or three times. The valley becomes wider and at Hoeyang is about 800 yards wide. Southeast of Hoeyang the route winds for about 7 miles through low, steep hills 300 to 600 feet above the road. Seven miles southeast of Hoeyang the route turns southward in a depression (somewhat similar to the one occupied by the railroad described above) 1/4 to 1 mile wide, extending southward to Kumsong. Both the road and a branch railroad follow this route. One mile west of Kumsong the road crosses the Kumsong-ch'on, a stream about 50 yards wide. At this crossing, each side of the river is bordered by a flat, 1/4-mile-wide, strip of paddy land. The road and railroad then continue southwestward in a narrow passageway, 200 to 800 yards wide, between eroded, grassy hills which are 300 to 500 feet above the road. For mile-long stretches there is ample room for movement; elsewhere the route is confined by rolling to steep hills. This condition of alternately wide and narrow valley continues for some 30 miles, from Kumsong to the southern end of the corridor near the village of Chip'o-ri.

Much of the passageway is planted to rice; the rest is terraced and planted to other crops, or is bare or grassy. Numerous side valleys 2 to 6 miles long and 1/4 to 1 mile wide lead into the hills on either side. In most places, the road follows the northwest side of the valley; it crosses to the southeast side only twice. The entire route is dominated (and locally is nearly blocked) by steep hills whose summits are 1,000 to 1,500 feet above the road. By-passes for flanking most of these bottlenecks are available, however. The soils of this corridor are

mostly reddish, well drained loams, underlain by sandstones, limestones, and shales. Near the pass in the northern part the loamy soils, where they are underlain by granites, are well drained and light colored. The stream valleys are covered with sand, gravel, or clay.

The terrain of this corridor is such that passage through it is alternately easy and difficult. The use of secondary routes will probably be necessary. The steepest part of both road and rail routes is near the northern end (FIGURE II-81). In general, the routes are passable but are not easy. They have more favorable terrain, however, than any other east-west passageways across Korea.

(b) *Drainage* (FIGURE II-80). The drainage of this strategic corridor is largely dominated by two principal rivers and their tributaries. The northeastern section is drained by the Namdae-ch'on and its several branches extending into the corridor to a steep, 2,000-foot-high divide, approximately 42 miles, by way of the corridor, from the east coast. The southwestern section is drained by tributaries of the Hant'an-ch'on, a tributary of the Imjin-gang which flows to the west coast.

The main valley or corridor on either side of the divide has numerous short, sharp turns. The valley is deep, steep-sided, and cut mostly through rock. Few tributaries join the main streams in this part of the corridor. Those that do are short and rapid, and flow through deep narrow ravines. Main streams have steep grades, and are less than 3 feet deep within the region. They average about 150 feet in width and flow between steep cliffs 50 to 100 feet high. There is practically no flood plain area in the narrow middle part of the corridor. Small flat areas are enclosed by high ridges extending close to the river's edge. The streambeds widen gradually as they near the Wonsan - Hamhung Lowland to the northeast and the inner margin of the Western Lowlands to the southwest.

(c) *Soil trafficability* (FIGURE II-83). Much of this area is rough mountain land where slope characteristics are more important than soil or weather conditions in determining trafficability. Valley soils are mostly loams and clay loams, but there is considerable variation, and sandy loams and sandy clays are also represented. There are some lowland rice paddy fields, but terraced paddy fields on hill slopes are more common. The paddy fields are flooded and nontrafficable from June through September.

Soils are most trafficable from mid-September through mid-November. From December through February there is usually a persistent snow cover, but it is seldom deeper than a foot in the valleys, except where drifted. Soil freezing also persists, on the average, from December through February, and aids trafficability where the snow cover is light or absent. Soil trafficability is poor during March and April as a result of melting snows and thawing soil. Trafficability conditions improve considerably during May and early June. From mid-June through mid-September, rainy days are frequent and periods of heavy precipitation are also more numerous than during the rest of the year. During summer, consequently, the lowland clays and loams are often slippery and muddy, and poor trafficability conditions occasionally extend throughout the area.

(d) *Vegetation*. The mixed forests in the Wonsan - Seoul Corridor have been largely cut over; scrub brush with interspersed grass areas are common throughout the region. The

northern entrance to the corridor has numerous patches of rice cultivation for about 15 to 20 miles inland from the coast. Cultivated fields are found on both sides of the Namdae-ch'on and they increase in size toward the coast. The corridor narrows to the south and its steep valley slopes are deforested, except on the higher ridges. On the lower slopes, grass areas are interspersed with scrub pine and oak. Much of the valley floor is barren except for occasional patches of grass.

Near the middle section of the corridor (along the railroad route) is a wide marshy area at the source of the Namdae-ch'on. There is also a small tract of rice cultivation to the west of the railroad and bordering the town of Sep'o-ri. The valley slopes are covered with numerous areas of grass.

The road through the corridor, south of the Pukhan-gang, is bordered by grassy hill slopes. In the valleys are numerous cultivated areas which increase in number to the southwest.

(6) *Region 6. Southern Taebaek Range and the Sobaek Range* (FIGURES II - 79 to II - 84; PLANS 10 to 15, 18 and 20; ROUTE SUPPLEMENT FIGURES RS-19 to RS-21).

The Southern Taebaek Range forms the backbone of southeastern Korea. Its northern end adjoins the Wonsan - Seoul Corridor. Its southern end adjoins the Naktong-gang Basin and Hills. Its eastern side borders the Eastern Coast Lowlands and Hills. The western side borders the Western Lowlands and Hills. The Sobaek Range extends southwestward from the central part of the Southern Taebaek Range, and is long and narrow. It lies between the Naktong-gang Basin and Hills and the Western Lowlands and Hills, and extends southward into the Southern Coast Lowlands, Hills, and Islands. The maximum north - south extent of the whole region is about 275 miles. The greatest width east - west is about 80 miles. The Sobaek



FIGURE II - 39. Southern Taebaek Range and Sobaek Range Region, Diamond Mountains section. App.  $38^{\circ}37'N$ ,  $128^{\circ}13'E$ . Stream valleys in this part of the region are rocky, narrow and winding. Slopes are steep and mostly forested. June 1928.

Range itself is about 140 miles long and 10 to 50 miles wide. The Hamch'ang - Ch'ungju road (Route F-1 on FIGURE II - 79) separates the Sobaek Range from the Southern Taebaek Range. The trend of the Southern Taebaek is approximately northwest - southeast and that of the Sobaek is northeast - southwest. Like the Northern Taebaek Range, this region is rugged, partly forested, and well drained (FIGURES II - 39, II - 40), but lacking in settlement and transportation routes.

(a) *Relief.* The terrain in the Southern Taebaek Range consists mostly of steep, rugged, grass- or tree-covered hills and rocky mountains 1,000 to 5,500 feet high (FIGURE II - 41). The Kumgang-san (Diamond Mountains) in the north are rocky and precipitous, in contrast with the rugged gullied mountains farther south. Mountains dominate and nearly block the winding, gorge-like valleys of the region. Valleys are usually 500 to 1,500 feet deep. Ridges are mostly oriented north - south, and valleys generally follow the same directions except for the short east-flowing streams. Summit elevations are greatest (3,500 to 5,500 feet) in the east and north. The Kumgang-san (Diamond Mountains) have numerous peaks more than 5,000 feet high. In the Sobaek Range, elevations are not only lower (2,000 to 5,000 feet, average about 2,500 feet), but a greater area has moderate slopes, and river valleys are more nearly continuous, wider, and have fewer gorges (FIGURE II - 80). The streams wind back and forth, however,

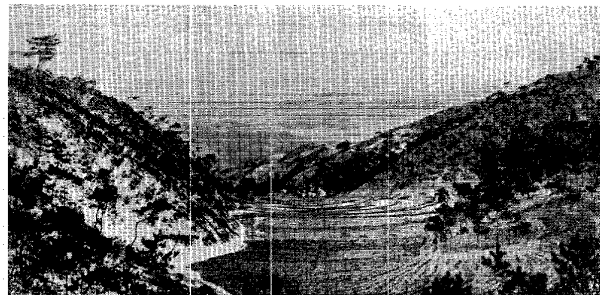


FIGURE II - 40. Southern Taebaek Range and Sobaek Range Region. Near Namwon. Looking westward toward Pinong Pass  $35^{\circ}25'N$ ,  $127^{\circ}02'E$ . Slopes partly covered with pine forest. March 1901.

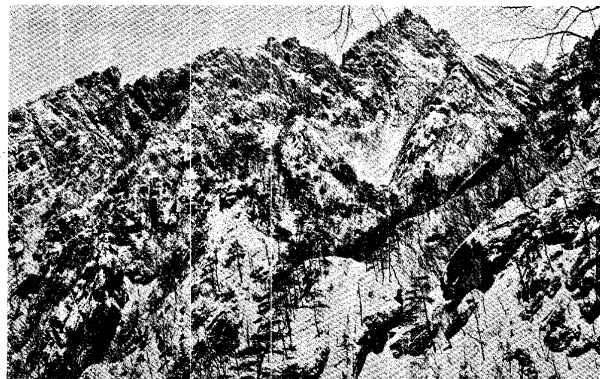


FIGURE II - 41. Southern Taebaek Range and Sobaek Range Region. Kwanum-bong. App.  $38^{\circ}40'N$ ,  $128^{\circ}10'E$ . Kwanum-bong is about a mile SW of Onjong-ni. Its rugged slopes are characteristic of the Diamond Mountains section of the region. Before 1931.

across the valley floors. Tributary valleys in the Sobaek Range are short and narrow (1 to 10 miles long and 50 to 400 yards wide). Like the Taebaek, the higher areas of the Sobaek are steep and rugged (FIGURE II - 81). Nearly all of the surface in both parts of this region is sloping; there is little flat land. The small areas of flat land in the valleys are very irregular in shape, and flat areas are not continuous on each side of the river (FIGURE II - 42). About  $\frac{2}{3}$  of the region has dark colored, probably reddish, well drained soils, underlain by such rocks as sandstone, limestone, and slate. About  $\frac{1}{3}$  of the region has lighter colored, well drained soils, underlain by granites. The valleys have gravelly or sandy soils.



FIGURE II - 42. Southern Taebaek Range and Sobaek Range Region. Near Hamyang. Looking from top of Palhyong Pass,  $35^{\circ}27'N$ ,  $127^{\circ}38'E$ , toward Kyongsang-do ridges. Road, lower center leads to Hamyang. March 1901.

All east - west routes across the Southern Taebaek Range are steep, narrow, and winding, and cross passes at least 1,200 feet high. They are probably not suitable for heavy, two-way traffic. Three principal routes cross the Sobaek Range: the Hamchang - Chungju (Route F-1 on FIGURE II - 79), the Kumch'on - Taejon (Route F-2) and the Namwon - Chonju (Route F-3). The main Pusan - Seoul road and railways use the Kumch'on - Taejon passage. (Route F-2) Although winding and narrow, this route has a maximum elevation of only about 800 feet near Kwan-ni (Shufurei Station). The Hamch'ang - Ch'ungju route (F-1) is an alternate between Pusan and Seoul. The highest elevation on this route is about 1,600 feet. The Namwon - Chonju passageway (F-3) is part of the Yosu - Seoul route. Like the others, it is narrow and winding. It has maximum elevations of about 330 feet.

Small-scale operations from southern or southeastern Korea to western Korea could use most existing roads or railways to cross the Southern Taebaek Range and the Sobaek Range. The passageways most favorable for large-scale operations across this region, however, are the three named specifically above.

(b) *Drainage* (FIGURE II - 80). In contrast to the Northern Taebaek which is drained east - west across the grain of its relief the Southern Taebaek Range is drained in the direction of its relief, generally northeast to southwest. South of Wonsan the main divide of the Taebaek Range is very near the Sea of Japan, and many short streams with steep gradients flow toward the narrow coastal lowland along the east coast. Penetration up stream valleys into this region from the east coast is difficult. Westward-flowing streams have lower gradients and give less difficult access to the basins of the outer western flanks of the

highlands. Higher in the mountains, however, the western stream valleys also become very difficult. The valleys between the ridges of the Sobaek Range trend northeast and southwest and are important agricultural areas. The western ridges of the Sobaek Range are drained by the Somjin-gang; the eastern parts by the tributaries of the Naktong-gang.

Most of the streams in the Kumgang-san (Diamond Mountains) rise in that section of mountains extending from Yon-gang-pong through Piro-bong to Wolch'ul-san. The steep slopes are dissected by many side valleys, and are eroded into a complicated pattern of gullies. The streams of the Diamond Mountains are characterized by debris-clogged rocky channels and steep rocky banks of granite, or limestone (FIGURE II - 39), which are very slippery when wet. The rocks in the stream beds are usually rounded and may be 9 feet in diameter. Waterfalls 35 to 40 feet high are numerous. The streams are generally less than 3 feet deep in their upper courses, except during the rainy season, when they become raging torrents.

Streams carry large amounts of debris downstream, and deposit it irregularly along their middle courses. In their upper reaches the streams of this section of the Southern Taebaek have steep gradients, and flow through gorges and canyons.

The upper streams of the Sobaek Range are less formidable than those of the Taebaek. Valleys are wider, stream gradients less steep, and water courses are winding, and sluggish. In the upper section of the Kum-gang, the river is very winding. Inside curves are low flats, covered with sand and gravel deposited during high water. Outsides of curves are bordered by steep bluffs, which block land movement and would necessitate continuous crossing and recrossing of the river in operations along the main valley. In straight sections, the banks are mostly sloping sand or gravel, but locally become very steep cliffs where high rocky ridges extend to the river.

The Kum-gang averages 400 feet wide. Numerous tributary valleys, with small delta plains at their mouths, join the main valley. Main streams, carrying large quantities of debris, have built large flood plains in their lower courses, and extensive deltas at their mouths.

(c) *Soil trafficability* (FIGURE II - 83). In this area, mountain and other rough lands of permanently poor trafficability predominate; terrain favorable for cross-country movement of wheeled vehicles is restricted for the most part to discontinuous valley lowlands. In lowland areas the predominant soils are loams and clay loams, although coarse-textured soils are prominent at some places. Rice paddy fields are more numerous than in northern mountain regions and are flooded and nontrafficable from June through September (FIGURE II - 42).

The period of most favorable trafficability of nonpaddy soils is from mid-September through November. Snow on the ground reduces trafficability somewhat from November through February, but the snow is usually less than a foot deep, and in the valleys of the southern part of the area it is seldom persistent. Soil freezing aids trafficability in the northern part of the area during the winter but there are periods of winter thaw in the southern valleys. During March and April, widespread poor trafficability conditions result from melting snow and thawing soil (FIGURE II - 40). Trafficability conditions improve during May and early June, but the lowland clays are often slippery and muddy as a result of light rains. From

mid-June through mid-September periods of widespread poor trafficability accompany the fairly frequent heavy rains. Lowland clays and loams are slippery and muddy most of the time, because of the high number of rainy days.

(d) *Vegetation* (FIGURE II - 84). The uncultivated vegetation of the Southern Taebaek Range and the Sobaek Range is of two major prevailing types: (1) forest and (2) low-growing brush and grass. The forests are largely on the higher elevations of the two mountain ranges. The brush and grass areas are interspersed with the forests at higher elevations and are predominant on lower intermediate slopes of the region. Small cultivated areas are in the bottom of larger valleys and on higher burned-over sections (fire fields) on the mountain slopes. Concealment for small groups of men is available in most of the region, but varies with the locality.

Forests are more widespread in the northern section of the Southern Taebaek Range than in the Sobaek Range. Within the northern section, the trees are large, averaging 2 to 3 feet in diameter. Forests are usually dense on the Kumgang-san (Diamond Mountains), although many local areas are more open. In general, the forests of the Southern Taebaek Range and the Sobaek Range are thick enough to retard cross-country movement. On the lower intermediate slopes much of the vegetation is grass, scrub pine, and shrubs. There are no large meadows, but limited supplies of forage are available. Supplies of fuel and timber for construction purposes are available in the Southern Taebaek Range but are very limited in the Sobaek Range.

There are numerous rocky and barren areas in the Southern Taebaek Range and the Sobaek Range (FIGURES II - 41). On the valley flood plains of both ranges are large barren stretches interrupted by scattered patches of grass.

1. **FOREST.** The forested areas of the Southern Taebaek Range and the Sobaek Range are predominantly mixed broad-leaf-coniferous forest with scattered undergrowth. Pine, spruce, fir, oak, birch, and aspen are most common species. The mixed forest varies in composition at different altitudes, particularly on the higher slopes of the Kumgang-san (Diamond Mountains), and also according to exposure. On the eastern slopes the forests are almost pure red pine; on the western slopes are small areas of deciduous broadleaf trees. In general, the forests of this region provide partial cover, moderately dense shade, and good concealment, especially during the summer season. Military operations in most of the wooded areas of the region would probably be hindered more by rough terrain than by vegetation.

2. **GRASS AND SHRUB.** Grass and shrub occupy widely scattered areas throughout the entire region. They include openings in the mixed broadleaf-coniferous forests, higher mountain summits, and large areas of grass-clad foothills and intermediate slopes of mountain ranges. Much grass and weeds, 4 to 6 feet high, grow in abandoned fire fields. Many kinds of shrubs, climbing plants, and vines grow on intermediate slopes near Chiri-san and the Kumgang-san (Diamond Mountains). Common shrub species include azalea, rose, magnolia, honeysuckle, and forsythia. Wild pear, crab apple, wild cherry, apricot, and other flowering trees grow in the depressions, at the edge of the forests, on the river banks, and in the open country. Gray willow trees grow along the high rocky stream banks.

Much of the grass is coarse and short (3 to 6 inches), but many bushes are 4 to 12 feet high.

3. **CULTIVATED AREAS.** There are small local cultivated areas in the larger valleys and in fire field clearings on higher slopes. The cultivated areas are small, with rice and low-growing vegetables predominating. The fire fields, particularly those on the steep slopes near Chiri-san and the Kumgang-san (Diamond Mountains), have numerous tree stumps and tree trunks lying between the rows of cultivated plants. Millet, buckwheat, oats, and potatoes are the principal crops. Partial concealment for small groups of men is usually available within these cultivated fire fields. The clearings are generally different in color from the surrounding forests, and vary from deep shades of green to light gray.

(7) *Region 7. Nakdong-gang Basin and Hills* (FIGURES II - 79 to II - 84; PLANS 14, 15, 18, and 20; ROUTE SUPPLEMENT FIGURE RS-21).

This region includes most of the area drained by the Nakdong-gang and its tributaries. It extends northward to about 36°55'N in the vicinity of Naesong, and southward to 35°05'N near Pusan and Chinju, a distance of some 125 miles. It is bordered on the west and north by the Sobaek Range and on the northeast and east by the Southern Taebaek Range and the East Coast Lowlands and Hills. Its width, east - west varies between 50 and 100 miles. Chiri-san (6,275 feet) is near the western extremity. The Nakdong-gang, the principal river, flows somewhat west of the middle of the region (FIGURES II - 43, II - 44, II - 45).

(a) *Relief* (FIGURES II - 79 to II - 82). About one-third of the area consists of flat valley floors less than 330 feet above sea level. These flat sections are chiefly along the Nakdong-gang and its major tributaries, and extend as much as 8 to 10 miles from the rivers themselves (FIGURE II - 43). Another third of the area consists of fairly low, rolling, much-eroded hills, rising abruptly from the valley floors to elevations of 600 to 1,500 feet and occasionally to 2,500 feet (FIGURE II - 44). The rest of the region consists of rugged, 3,000- to 4,000-foot mountains, with Chiri-san, 6,275 feet, rising above the general level. The river flood plains occupying parts of the lowland directly adjacent to the streams are flat and nearly bare of vegetation, and are covered with sand, cobbles or boulders. The rivers meander widely across flood plains. These flood plains are widest inside the curves and may be completely lacking on the outsides of the curves where the rivers have cut cliffs into the bordering hills. Dikes and levees as much as 15 to 20 feet high separate the flood plains from the rest of the

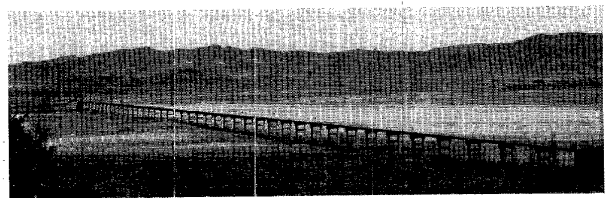


FIGURE II - 43. *Nakdong-gang Basin and Hills Region.*  
Andong, 36°32'N, 128°43'E.

Probably looking NE. In the dry season the Nakdong-gang is shallow. The valley at Andong is about a mile wide and dominated by hills. The town is N of the river. Dikes line the far shore. December 1934.

Restricted

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FIGURE II - 44. Nakdong-gang Basin and Hills Region.  
Near Taegu. 35°52'N, 128°35'E.

Steep, partly forested hills as shown here command the tributaries of the Nakdong-gang. Parts of the valley floors are nearly flat, and streams are winding. Before 1931.



FIGURE II - 45. Nakdong-gang Basin and Hills Region. Near  
Yongwon Pass. App. 35°24'N, 127°40'E.

Looking NNE. These hills are characteristic of the terrain in the vicinity of Chiri-san. The forest is mostly Mongolian oak. Before 1931.

valley bottom (FIGURE II - 43). The rest of the valley floor area is also flat, and is not generally much higher than the rivers. Fingers of lowland extend 3 to 10 miles up the smaller valleys. Terrain conditions favor large-scale operations in the lowlands, except on wet rice fields and during wet summer weather.

There is almost no level land in the hill country (FIGURE II - 44). Most of the hills are rolling, but are much eroded. Along the streams are sharp banks or cliffs 10 to 300 feet high. Steep slopes predominate in the higher hills (FIGURE II - 81). Surface conditions are unfavorable for cross-country movement by troops and the terrain is very unfavorable for the operation of vehicles off established roads, especially during wet summer weather.

Rugged mountain peaks and ridges rise 500 to 3,000 feet above the hill tops (FIGURE II - 82). They are conspicuous landmarks and dominate most of the surrounding country for 5 or 10 miles. Like the hills, they are very much gullied and have mostly steep slopes and cliffs. From a distance they appear barren; from nearby they prove to be covered with scattered grass, brush, and trees. A few peaks are even well forested (FIGURE II - 45). Streams flow rapidly in narrow, steep-walled gorges or wind through flat but narrow valleys. Terrain conditions in the mountains do not favor operations by troops on foot and virtually prohibit vehicle operation.

1. TYPE AREA: CHINJU. The vicinity of Chinju, shown



FIGURE II - 46. Nakdong-gang Basin and Hills Region.  
Hilly terrain near Songam.

Descent northward to Songam from the Taikok Pass. Peak in left background is Kuksa-bong, app. 35°29'N, 128°15'E, app. 2,250 feet elevation. March 1901.

in FIGURE II - 93, contains representative lowland and hill terrain. The flat, winding valley of the Nam-gang, a tributary of the Nakdong-gang, is 300 to 2,500 yards wide.

The channel of the Nam-gang is 100 to 250 yards wide. It may be much deeper and wider during summer rains. In this area the river is about 65 feet above sea level. Tributaries enter the Nam-gang at intervals of 2 or 3 miles from flat, winding valleys about 300 yards wide. Dikes confine flood waters of the Nam-gang, the Nakdong-gang, and most of the tributaries (FIGURE II - 43). Occasional ponds on the valley floor occupy former stream courses, and small depressions. Between the dikes and the Nam-gang the flood plain is barren, sandy, or cobbly waste, with a few patches of grass and scattered trees as the only vegetation. Between the dikes and the hills the flat valley floor is planted to rice or dry crops. Rice is cultivated for 3 to 10 miles up the tributary valleys but not up the steep slopes (FIGURES II - 44, II - 46). Soils in the valleys are chiefly sand, gravel, and clay. Terrain conditions on the valley floors favor movement on foot or by vehicles, except on wet rice fields and in wet summer weather. Many cobbles and boulders would obstruct vehicle movement on the flood plains.

River valleys are dominated by steep, gullied hills which rise 300 to 1,600 feet above the river (FIGURE II - 46). These hills are only sparsely covered with scrub, trees, and grass; during heavy summer rains much soil is washed down the slopes. There are few bluffs, except along the rivers, but most hill slopes are steep.

Cross-country movement by troops on foot would be difficult. The relief does not favor the use of mechanized equipment off roads anywhere in the hills (FIGURE II - 44). The small stream valleys provide a large number of narrow passageways. These could be blocked easily, however, and many lead to dead-end ravines.

2. TYPE AREA: CHIRI-SAN. Terrain on Chiri-san and in its vicinity is representative of conditions to be found in the mountains of the Nakdong-gang Basin. Chiri-san, 6,275 feet elevation, rises more than 5,600 feet above the valley of the Im-ch'on (elevation 650 feet), a small tributary of the Nakdong-gang (FIGURE II - 94). Steep slopes rise directly from the Im-ch'on, but cliffs are not common below 5,000 feet. Above 5,000 feet the mountain is mostly moss-covered rock, with little soil and no vegetation. On some nearby summits where slopes are more moderate, scattered grass is found, but above

5,000 feet most of the surface is bare rock. Below 5,000 feet, vegetation is generally limited to scattered grass, brush, and trees. Some peaks have fairly thick forest (FIGURE II-45). Permanent streams exist only on the lower slopes; dry gullies are found above 4,000 feet. During heavy summer rains the soil becomes saturated and streams fill. At this stage they carry large amounts of sand, gravel, and even boulders downstream. Soils in the mountainous areas are largely light colored over granite, and reddish above sedimentary rocks. Most of the mountain soils are well drained.

3. ROUTES (FIGURE II-79). The Nakdong-gang Valley, 1 to 10 miles wide, provides a very winding passageway from near Pusan northward about 150 miles to the vicinity of Andong (Route G-1 on FIGURE II-79). From the two east coast lowlands at Yongil-man and Ulsan-man, 1/2- to 3-mile-wide valleys extend inland to the head of the Nakdong-gang, over passes about 400 feet high (Routes B-3). Another route (G-2), leads eastward from Andong to Yongdok on the east coast. This route leads up the Kiran-ch'on and over two passes, 1,030 and 1,310 feet high, then descends steeply to Yongdok. This route is winding and is about 150 yards wide at the passes. Stream valleys along the way are mostly planted to rice, but the upper parts of the passes are sparsely covered with grass, brush, or trees. Two winding routes lead out of the Nakdong-gang Basin toward Seoul. One (Route F-1) leads northwestward from Hamch'ang through rolling hill country. It leads over a 1,640-foot pass in crossing the Southern Taebaek Range. The second (Route F-2) starts at Kumch'on, and within 10 miles crosses an 800-foot pass over the Sobaek Range. Another route (G-3) starts at Chinju, leads up the Tokch'on-gang Valley for about 5 miles, then continues over a 650-foot pass into the South Coast Lowlands, Hills, and Islands.

4. IMPORTANT AREA: PUSAN (FIGURE II-47). Pusan, the principal entry to the Nakdong-gang Basin, lies on a small lowland dominated by steep, 1,000- to 2,000-foot hills. Its harbor is partly closed by a small island, Mok-to. The road inland from Pusan passes through moderately low country to Tongnae. It then leads northwestward over a ridge about 650 feet high to Yangsan and enters the Nakdong-gang Valley. The railroad from Pusan goes among low hills directly west into the lower Nakdong-gang Valley. The mouth of the Nakdong-gang is low and marshy, and not favorable for movement inland.

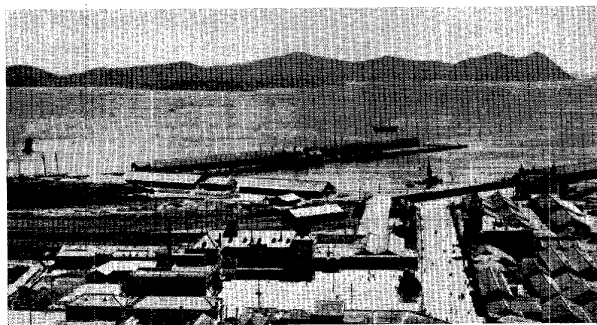


FIGURE II-47. Nakdong-gang Basin and Hills Region.  
Pusan, 35°05'N, 129°05'E.

Looking E. Pusan harbor is flanked by two peninsulas, and is guarded by an island, Mok-to. This view shows the peninsula E of the city. Other views of this area are shown in Chapters IV, VI, VII, and VIII.

(b) Drainage (FIGURE II-80). The Nakdong-gang is the second largest river in Korea and the major stream of the southeastern part of the peninsula. It rises on the southern slopes of the Southern Taebaek Range, drains a basin area of more than 9,000 square miles, flows in a general southerly direction, crosses a large delta in the bay northwest of Pusan, and empties into Korea Strait. The river is about 320 miles long; within that distance it falls from an elevation of about 1,600 feet at its source to sea level. The Nakdong-gang and its numerous tributaries drain the southern slopes of the Taebaek and Sobaek Ranges, and flow in low, winding, gently sloping beds. Many large tributary streams, such as the Miryang-gang, Nam-gang, Hoe-ch'on, Kumho-gang, and the Naesong-ch'on, extend back from the main river for more than 50 miles into the mountains. Numerous smaller streams, 10 to 20 miles long, drain low marginal hills.

The Nakdong-gang has an average width of 1/4 to 1/2 mile in its lower course. Along much of its upper course the river maintains a fairly constant width of 150 to 200 yards. Near Samnangjin, about 15 miles upstream, the river is about 1/4 mile wide; near Hyonp'ung, 175 to 200 yards wide; in the vicinity of Sammul-li, about 1/2 mile wide. Upstream, the river gradually narrows and near Nakdong-ni its channel is from 300 to 400 feet wide.

Normal depths in the Nakdong-gang vary from less than 3 feet to 18 feet. The river is navigable for light craft (sailing and motor boats) for about 200 miles. There are shallow channels in the delta with depths of 2 to 3 feet for about 11 miles from the mouth of the river. Near the junction with the Miryang-gang the Nakdong maintains a depth of 9 to 10 feet. The irregularity in depth within short distances is shown near Namji-ri, 40 to 50 miles upstream. Here the river flows for a short distance through a gorge with a water depth of 54 feet. Two to three miles farther upstream the river is only 6 to 9 feet deep; at Nakdong-ni there is a depth of about 7 to 8 feet, and near Andong in the upper course, the depth decreases to 1 to 2 feet (FIGURE II-43). The stream beds of the main river and its tributaries have very moderate gradients except near their sources. Stream bottoms are mostly sand, gravel, and cobbles. Nearly all banks of the Nakdong-gang are low (5 to 10 feet) and only moderately steep. They consist mostly of sand and gravel. There are several cliffs more than 100 feet high along the upper and lower sections of the Nakdong-gang, where the river curves alongside high ridges extending to the water's edge. There are hundreds of bends along the river course and generally the banks on the insides of curves are lower than the banks on the outsides. In many places the banks are thinly covered with scattered patches of grass, willow trees, or thickets. There are also many long barren stretches on the banks, with numerous rocks and boulders deposited during floods. The steeper banks are easily undermined in places and change their height and width, especially during floods.

Dikes confine much of the flood water of the Nakdong-gang and its numerous tributaries (FIGURE II-43). The flood plains along the main river are more than a mile wide in many places. They are especially wide on the insides of curves. Long stretches of the flood plain lack any vegetation. These barren areas are from 50 or 100 yards to 30 or 40 miles in length. As in many sections of Korea, the sandy beds of the rivers and streams are very porous. The rivers carry a great amount of debris and

have raised their beds somewhat above the valley floor. When in flood they may inundate the rice fields in low-lying valley bottoms.

Many of the dirt embankments along the flood plains are planted to poplar and willow; except for small patches of grass the long, winding, barren areas of flood plain are continuous. No streams of this region freeze, but they are extremely low during the winter season. They are generally fordable except during periods of flood (FIGURE II - 43).

(c) *Soil trafficability* (FIGURE II - 83). Numerous valleys in this area provide fairly extensive areas of topography favorable for cross-country movement of wheeled vehicles. In the south central part of the area clay loams predominate and there are smaller areas of sandy loams, sandy clays, and loams. In the western, northern, and eastern marginal areas the soils vary greatly from place to place. Rice paddy lands occupy much of the valley lowlands and terraced hill slopes, and are flooded and nontrafficable from June through September.

The most favorable period for cross-country vehicular movement on nonpaddy soils is from September through December. In most lowland regions, trafficability is only slightly less favorable from January through March; precipitation during these months is light and infrequent and the light winter snows are seldom persistent (FIGURE II - 46). The soil freezes for short periods during January and February in the northern part of the area and even less frequently in the south. Consequently there are short periods of poor trafficability when the soil thaws. During April, May, and early June, there is a gradual increase in the average number of rainy days and the amount of precipitation. This results in occasional periods when the lowland clays and loams are nontrafficable. From the middle of June through September there are periods of widespread poor trafficability accompanying occasional heavy rains, and frequent light rains render the lowland clay and loam soils slippery and muddy much of the time. This is the least favorable period for cross-country movement. Soil trafficability conditions in the coastal part of this region are usually worse than in inland parts having similar terrain.

(d) *Vegetation* (FIGURE II - 84). The region is largely open. The hillsides have a sparse covering of grass and small patches of woods. The valleys and intermediate slopes are under intensive cultivation (FIGURE II - 46). From the broad alluvial delta section and numerous tributary valleys to the distant upstream river course, the lower parts of the basin are planted to wet and dry crops. Practically every patch of land that can be cropped has been put to use (FIGURES II - 44, II - 46). The main crop is paddy rice. Barley and wheat are next in importance, together with a considerable variety of other crops, including cotton, tobacco, and various fruits. There is little cover or concealment available, either in the cultivated fields or amid the natural vegetation (FIGURE II - 46).

On the flat flood plains or valley floors there are few trees (FIGURE II - 43). Poplars usually line the roads and irrigation ditches. Scattered along the stream banks and barren areas are patches of grass. There are some hill areas of recently planted woodlands. Strips of coarse grass (4 to 5 inches high), scattered hedges, and trees have been planted to check erosion on the hillsides (FIGURE II - 48).

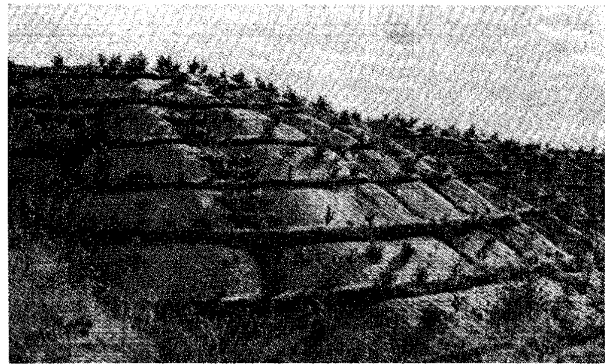


FIGURE II - 48. Naktong-gang Basin and Hills Region.  
*Reforested hillside.*

Part of government reforestation program to replenish Korea's forests and check soil erosion.

On the higher inland sections of the region, including the slopes of Chiri-san, are patches of mixed broadleaf trees, conifers, and grass. These comprise the principal forested areas within the region (FIGURES II - 45, II - 84). Birch, oak, pine, and fir are the principal tree types. There is considerable woody undergrowth, and on the rocky grass-clad slopes are bushes and thickets of climbing plants. Most abundant are the azalea, rose, lilac, forsythia and spiraea, which make a conspicuous display on the hillsides.

On the higher slopes of Chiri-san in the marginal areas of this region, at about 3,000 feet, are burned-over fire fields. These areas are not entirely cleared but have stumps and tree trunks remaining in the fields (FIGURE II - 35). The stumps are from 3 to 9 feet high and tree trunks without limbs project up to 30 feet high. There are many bushes or shoots from the half charred stumps. Where the fields have been abandoned, they are covered with bushes and weeds. Concealment for small scattered groups would be available.

(8) *Region 8. Southern Coast Lowlands, Hills, and Islands* (FIGURES II - 79 to II - 84; PLANS 18 to 22, 24, and 25).

This region extends about 160 miles, east - west, and is 25 to 65 miles wide, north - south. On the east it borders the Naktong-gang Basin and Hills. On the north, the region borders the Naktong-gang Basin and Hills, the Soback Range, and the Western Lowlands and Hills. To the south and west respectively are the Korea Strait and the Yellow Sea. About 60 miles southeast of the eastern part of the region is Tsushima (Subregion 9b) and about 90 miles south of the western part of the region is Cheju-do (Subregion 9c).

(a) *Relief* (FIGURES II - 79 to II - 82; II - 95, II - 96). The relief is extremely complex. It consists of many disconnected lowlands and valleys, most of which are small and dominated by steep, bare, eroded hills. The valleys are oriented in a general southeast or southwest direction, but the hills and ridges have no dominant trend. Some southward-trending ridges extend to the ends of promontories. The waters offshore are made dangerous by hundreds of islands of all sizes, mostly steep and rugged, although a few scattered islands are low and flat-tish. These islands lie as much as 50 miles off the coast. The mainland lowlands are intensively cultivated, mostly in rice. Many hills and ridges are nearly barren and are much eroded.

1. REPRESENTATIVE AREA: YOSU (PLANS 20 and 21; FIGURE II-95). The terrain in the vicinity of Yosu is representative of the coastal area of this region. Conditions along the entire south coast are similar to those shown in FIGURE II-95. The coast here is very irregular. The tidal range is about 12 feet and at low tide extensive mud flats are exposed. Yosu, like Mokp'o and many west coast ports, is situated on a small bay near the end of a hilly promontory instead of at the head of a large bay. The town is wedged in between the water's edge and a 720-foot hill. About a dozen hilly islands lie within 5 miles of the town, and restrict the water approaches to Yosu (FIGURE II-49). The shore is mostly steep and rocky, but not generally cliffed. There are, however, short, narrow stretches of low shore, mostly muddy, but with some sandy beaches (FIGURE II-50). East of the city a low, 800-yard-wide neck of land separates the harbor from Aenggang-man (Okōwan) (Carpenter Bay) to the east. To the north and west, 1,100- to 1,200-foot hills command the city and harbor.

The road and railroad leading inland from Yosu follow winding, narrow routes. These routes are 200 to 400 yards wide and have extensive rice fields (FIGURES II-51, II-52). The passes on these routes are generally lower than 500 feet. The hills are almost entirely steep sided. They do not generally have cliffs, but are greatly eroded and sparsely covered with

grass, scrub, or scattered trees. (FIGURES II-53, II-54) Summit elevations within 5 miles of the coast are 500 to 2,500 feet.

2. REPRESENTATIVE AREA: MOKP'O (PLAN 38; FIGURE II-96). Terrain in the Mokp'o area is similar to that around Yosu. Mokp'o is at the end of a peninsula 10 miles long, extending southwestward (FIGURE II-55). Its harbor opens upon the estuary of the Yongsan-gang. The waters to the west have many islands. There is a tidal range of about 15 feet, extensive mud flats are exposed at low tide. A complex of steep, 300- to 1,000-foot hills, with small flat basins and short, narrow stream valleys, occupies most of the Mokp'o Peninsula. Routes inland from Mokp'o follow winding courses, successively skirting the shore, avoiding rice fields and marshes, and passing between low, steep hills.

3. REPRESENTATIVE AREA: MASAN. Masan is at the head of Chinhae-man. This bay has a lower tidal range than the western parts of the south coast, but is deeply indented, and has its approaches obstructed by numerous islands. Masan, like Yosu and Mokp'o, is situated on a small lowland, hemmed in by steep hills. Narrow passageways lead to the north and south, but movement inland from Masan is restricted and dominated by the surrounding hills.

4. INTERIOR OF REGION. The hilly interior of this region is a continuation of the Soback Range (FIGURE II-81). It consists of steep, eroded, mostly grass-covered hills and mountains, 1,000 to 5,000 feet high, which overlook narrow, winding valleys (FIGURES II-54, II-82). Approximately 9/10 of



FIGURE II-49. Southern Coast Lowlands, Hills and Islands Region. Yosu.  $34^{\circ}44'N$ ,  $127^{\circ}43'E$ . Looking S from Yosu, toward some of the many islands off the S coast. Taeyong-do in the distance.



FIGURE II-50. Southern Coast Lowlands, Hills and Islands Region. Nuksum Island, about 12 miles NW of Yosu. App.  $34^{\circ}52'N$ ,  $127^{\circ}40'E$ .

Looking S. The S coast of Korea is very irregular, with numerous small beaches, steep promontories, and hundreds of islands.

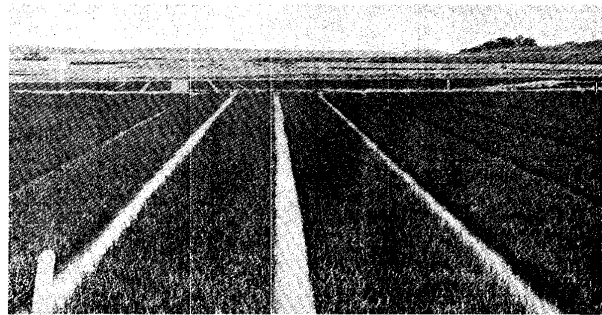


FIGURE II-51. Southern Coast Lowlands, Hills and Islands Region. Cholla-namdo Province.

Rice seedling plots. The flat basins and valleys of this region are planted mostly to rice. Before 1931.



FIGURE II-52. Southern Coast Lowlands, Hills and Islands Region. Near Sunch'on. App.  $34^{\circ}55'N$ ,  $127^{\circ}30'E$ .

Looking N toward Sol-chi Pass from near Sunch'on. February 1901.

Restricted

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the area has steep slopes. The higher summits are edged with cliffs. The barren character of these hills and mountains tends to exaggerate their real height (FIGURE II - 52). The terrain does not favor rapid or large-scale movement.

Soils are mostly reddish, well drained loams or poorly drained clays, underlain by limestones, sandstones, and slates. An area about 15 miles by 5 miles, at the head of Tungnyang-man has lighter colored loams and clays, underlain by granites.

5. ROUTES. Routes across this region are not generally steep, but are very winding. A road and railway (Route H-1 on FIGURE II - 79) cover the 25 miles between Masan and the

main Pusan - Seoul route. Except for the northeasternmost 5 miles, this route traverses flat basins and low hill country and crosses extensive rice field areas. The last 5 miles are parallel to the Nakdong-gang. The route crosses the river about a mile southwest of Samnangjin.

Another road and rail route (Route H-2 on FIGURE II - 79), crosses the region from Yosu to Namwon, a distance of about 70 miles, thence turns northward to Seoul. This route climbs gradually through steep, hilly country to a pass about 900 feet high, about 30 miles from Yosu. North of this pass the route winds down to the valley of the Somjin-gang. Both road and railroad parallel this river for about 20 miles, then cross to the northeast side, skirting about 10 miles of rice fields to Namwon. A third road and rail route (Route H-3 on FIGURE II - 79) goes northeastward from Mokp'o across hilly country, ascends steeper and higher hills to a 900-foot pass in the Western Lowlands and Hills Region, and continues on to Chonju. There it meets the Yosu - Namwon - Seoul Route.

Several features are common to all these routes: (a) They are moderately to very winding; (b) They avoid rice fields wherever possible; (c) Their passes are lower than 1,000 feet; (d) They offer numerous possibilities for deployment; (e) The terrain favors cross-country movement in much of the lowlands, except over wet rice fields and after heavy summer rains; (f) The terrain does not favor operations above 1,500 feet elevation in the hills and mountains.

6. IMPORTANT AREAS. The three most important areas in the Southern Coast Lowlands, Hills, and Islands Region center on the three ports of Masan, Yosu, and Mokp'o. Each is the terminus of road and rail routes.

(b) *Drainage* (FIGURE II - 80). The drainage of the Southern Coast Lowlands, Hills, and Islands Region is mostly to the south. The most important rivers or drainage systems within the region are the Somjin-gang which drains much of the northern and eastern sections, and the Yongsan-gang near the southwestern border of the region. Both rivers and many of their tributaries rise on the southern slopes of the Sobaek Range and follow very winding courses. The Yongsan-gang drains the Honam-p'yongya (Chonnam Plain) northeast of Mokp'o. This river is about 75 miles long and empties into the Yellow Sea. The Somjin-gang forms part of the boundary between Chollapukto and Kyongsang-namdo provinces. The river course is over 130 miles in length. It drains an area of about 1,900 square miles and flows into Korea Strait. Both major rivers flow in low, winding, moderately sloping valleys. Many of the larger tributary streams of the Yongsan-gang, such as the Hamp'yong-ch'on and the Komagwon-ch'on, are 10 to 15 miles long. The tributaries of the Somjin-gang, such as the Posong-gang and the P'esu-ch'on, are 25 to 40 miles long. Many smaller streams, 2 to 5 miles long, drain the marginal hills throughout the region (FIGURE II - 53).

At their mouths, the Yongsan-gang and the Somjin-gang are 500 yards and 700 yards wide, respectively. Twenty-five to thirty miles up the Yongsan-gang, near Yongsanp'o, the river narrows to about 150 yards. Tidal influence extends still farther upstream to near Naju, with the river maintaining an almost constant width of 150 to 200 yards in this section. Farther upstream near Soch'ang-ni it is about 100 yards or less wide. The course far upstream gradually narrows, and near Tamyang it is about 50 yards wide.

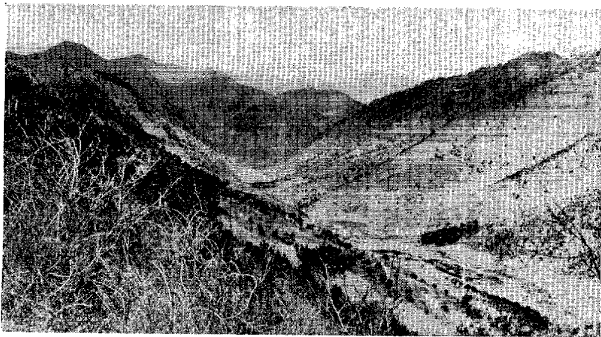


FIGURE II - 53. Southern Coast Lowlands, Hills and Islands Region. Near Sol-chi Pass, between Kurye and Sunch'on. Looking N from Sol-chi Pass. Stream has falls and rapids. Vegetation on hills is sparse. February 1901.

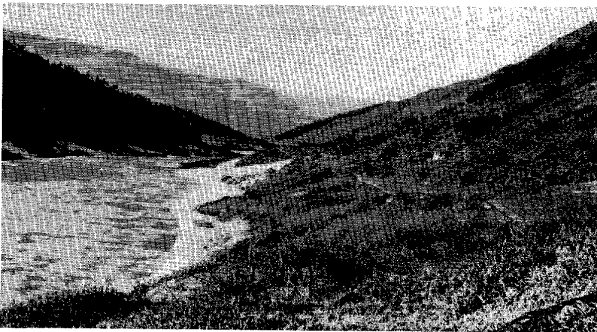


FIGURE II - 54. Southern Coast Lowlands, Hills and Islands Region. Somjin-gang. App.  $35^{\circ}05'N$ ,  $127^{\circ}45'E$ . Looking W. Open valley of the Somjin-gang. Slopes have a sparse vegetation cover. River is partly filled with ice. February 1901.



FIGURE II - 55. Southern Coast Lowlands, Hills and Islands Region. Mokp'o. App.  $34^{\circ}47'N$ ,  $126^{\circ}20'E$ . Looking approximately SE, across outer part of Mokp'o and harbor. February 1901.

Water depths in the Yongsan-gang, from Yongsanp'o to the mouth, are 13 to 24 feet, except for shallows at the junctions of several tributary streams. These streams deposit heavy loads of sand and gravel at their mouths, and in these places the main stream is only 2 to 4 feet deep. The river maintains a relatively deep channel upstream from its mouth to near Naju. The remainder of the upstream section is very shallow and averages 1 to 3 feet deep.

The average width of the Somjin-gang is greater than that of the Yongsan-gang throughout the river course. About 10 miles upstream from its mouth the Somjin-gang is about 200 yards wide; 20 to 25 miles upstream, near Hwagae-jang it is about 150 yards wide; 40 to 50 miles upstream, near the junction of the Posong-gang, 100 to 150 yards. At the road crossing south of Namwon the Somjin-gang has a width of 100 to 150 yards. In much of the far upstream course, it is about 100 yards wide (FIGURE II - 54).

The Somjin-gang has a depth of about 18 feet in its entrance. Near Hadong it is 12 feet deep; about 10 miles farther upstream, at a junction with a tributary it is only about 3 feet deep, but 3 or 4 miles farther upstream, depths exceed 12 feet. Thirty to forty miles upstream the river is about 6 feet deep. Farther upstream where the road and railroad to Namwon cross the river, there is a depth of 3 to 4 feet. The river maintains a normal depth of about 3 feet for much of its upper course.

Streams in this region are not frozen for long periods (FIGURE II - 54). The upper sections may have ice along the banks for several days or a week but not continuously during the winter season. Streams are generally fordable except during periods of flood.

Stream banks within this region are mostly sand and gravel, and average about 5 to 10 feet high. There are very few cliffs along the stream courses, but steep banks border the Yongsan-gang at several places. The banks of the Somjin-gang are lower and not as steep as those of the Yongsan-gang. The Yongsan-gang and the Somjin-gang and their tributaries have very winding courses. The banks on the insides of curves are lower than those on the outsides. Upper sections of streams are bouldery, but not so much so as in most of the other regions. Stream beds are mostly sand and gravel. Large deposits of these materials are especially abundant in the lower courses at the junction of the tributaries, and at the delta mouths of the main rivers.

The flood plains of the western section (Chonnam Plain area) of this region are wider than those in the other parts (FIGURE II - 81). The average width of the Yongsan-gang flood plain is  $\frac{1}{4}$  to  $\frac{1}{2}$  mile. Maximum widths exceed a mile in many places. The Somjin-gang flood plain is restricted in most places to 50 or 100 yards, and exceeds a width of  $\frac{1}{4}$  mile in only a few of the widest sections. Much of the flood plain is of sand, gravel, and pebbles. The Yongsan-gang area is one of the most intensively cultivated sections in Korea. There are confining dikes, and sand and gravel embankments, especially near the mouths of tributaries. Barren stretches are few in number. Where there is no cultivation, patches of grass grow on the flood plain, especially on the inside sections of the numerous bends. The Somjin-gang, by contrast, has many small, scattered barren stretches throughout its flood plain area. Its flooded areas are not cultivated so intensively as are those in the western part of the region.

Along the south coast are many short streams which drain the nearby hills and lowlands. These streams reach the coast at small bays separated by numerous headlands. Most of the bays are shallow and consist largely of mud flats.

(c) *Soil trafficability* (FIGURE II - 84). Much of this area is rough hill and mountain land where slope characteristics are more important in determining trafficability than are soil or weather conditions. Fine-textured soils (clay loams) predominate in the southern part of the area and on many of the southern islands. Soils of the western islands are mostly sandy loams and sandy clays. In the rest of the area the soils are more varied from place to place. Rice paddy fields are common in eastern and northwestern valleys and on terraced hill slopes (FIGURE II - 52). The paddy fields are flooded and nontrafficable from June through September.

Trafficability in areas of nonpaddy soils is most favorable from October through December in the east, and during October and November in the west. From December through early March snows are fairly frequent in the western part of the area, but are much less frequent in the east. The snows are light, however, and usually melt rapidly. Periods of shallow soil freezing occur during January and February but are infrequent. During normal years, therefore, trafficability conditions during the period of light precipitation (from November through April) are only slightly less favorable than during October and November. Precipitation increases both in frequency and amount during May and early June, and the lowland clay loams and clays are often slippery and muddy and occasionally will mire vehicles in some local areas. The least favorable soil trafficability conditions occur from mid-June through September. Periods of widespread poor trafficability are fairly frequent during July and August, and during late June and September the lowland loams, clay loams, and clays are usually slippery and muddy.

(d) *Vegetation* (FIGURE II - 84). The region is largely deforested and covered with coarse grasses and numerous low shrubs. A conspicuous feature is the evergreen broadleaf forest which occupies a narrow strip along the coast in the southwestern part of the peninsula. This evergreen forest extends from sea level up to an altitude of about 600 to 1,200 feet, where it merges into a mixed forest. Pine predominates on the hillsides. Bamboo thickets in clusters are common around farm houses and buildings. Vegetation provides limited local concealment, except in the barren ravines and on the rocky slopes.

Small patches of cultivation are numerous at the heads of the many coastal bays and inlets. Two of the larger cultivated areas are the valley basins of the Yongsan-gang and the Somjin-gang. The Yongsan-gang Valley is cultivated intensively and almost continuously, from the coast inland to the upper parts of the basin. Many side valleys also are under cultivation (FIGURE II - 52). Paddy rice is the most important crop on valley bottoms and the several small plain areas. Much cotton is produced in this region, particularly in the southwest corner. Both rice and cotton are largely export crops.

This is a region of double cropping and rice is usually followed by barley or wheat (FIGURE II - 51). Much of the dry farming is mixed, with rows of different crops sown and harvested on the same field. Bamboo and mulberry bushes are sometimes cultivated in rows, but are also planted along the edges of the dry fields. In some places, soybeans are commonly

planted on the embankments of wet rice fields. Dry crops are sown in the rice fields in October and are harvested in June; rice occupies these fields the rest of the year.

Dry fields are confined to the lower parts of the slopes. Where the dry fields have furrows, the winter crops grow in the furrows and the summer crops on the crests. Important crops, in addition to those already mentioned, are sweet potatoes, hemp, tobacco, pumpkins, and melons.

Except in the valleys of the Yongsan-gang and the Somjin-gang, cultivated areas are of variable size and scattered. There are only a few marshes within the region, and these are largely along the south coast near the heads of bays. Marshes are small and could be bypassed. A few areas have been burned over for fire fields. These lie at the higher elevations but are small and relatively unimportant in this region.

On the numerous, small, south coast islands, there are patches of cultivation along the lower courses of the many short streams. The vegetation of the islands is largely mixed broad-leaf-coniferous forest and grassland (FIGURE II - 49).

(9) *Region 9. Island Approaches* (FIGURES II - 79 to II - 84; PLANS 16, 17, and 23).

Three large islands or island groups lie on the sea approaches to Korea. From north to south they are (a) Ullung-do (Utsuryō-tō) (Dagelet Island), (b) Tsushima (2 islands), and (c) Cheju-do (Saishū-tō) (Quelpart Island). Each of these island subregions is described separately below.

(a) *Ullung-do*. This island is in the Sea of Japan, and is 80 miles from the east coast of Korea.

1. RELIEF, DRAINAGE, AND VEGETATION (FIGURES II - 79 to II - 82, and II - 84). Ullung-do is a shield-shaped island with 3 prominent headlands, pointing northeast, west, and south. It is 7 miles long and 5 miles wide. Its coast is almost entirely steep and rocky, being a succession of cliffs 300 or more feet high alternating with short, cobbly beaches backed by very small lowlands. Steep, mostly wooded slopes lead to a rugged, forested interior (FIGURE II - 56). Lava cliffs 300 to 1,000 feet high and ½ to 2 miles long trend at right angles to the coast.

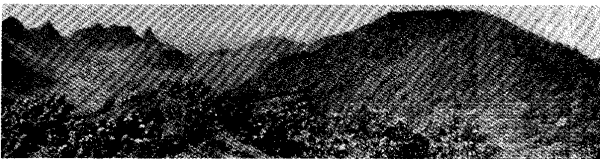


FIGURE II - 56. *Island Approaches. Ullung-do. App. 37°30'N, 130°52'E. Looking N across rugged interior of Ullung-do toward Songin-bong.*

Most terrain on this island is unfavorable for cross-country movement. Luxuriant vegetation covers many slopes. Before 1935.

Seven or eight peaks, 1,600 to 3,200 feet high, form a circle in the northern part of the island and enclose the only extensive areas of nearly flat land on the island. The greatest extent of these flat areas is about a half mile. They are dominated by the peaks and by round-topped lava ridges which rise 300 to 1,500 feet above the flat lands. Streams are short and swift; their valleys are narrow with steep sides, but there are few cliffs. The soils are of lava origin, acid, and probably light

colored. Nearly ¾ of the island is forested. Mixed deciduous and needleleaf trees predominate.

2. ROUTES. Ullung-do has no motor roads or railroads. A winding trail or cart path completely encircles the island. The rugged terrain does not favor overland movement by foot troops or by vehicles.

3. IMPORTANT AREAS. The most important parts of the island are the small stretches of low, cobbly shore and small areas of nearly flat land in the interior (FIGURE II - 81). Low, cobbly coasts are found in two places on the north coast (near the villages of Hyonp'o-dong and Ch'onbu-dong) and also about a mile north of Kanyong-mal (point) at the southern extremity of the island. The trail or cart path going around the island passes close behind all of these areas of low shore. The low area near Hyonp'o-dong extends about 1,400 yards north-east - southwest. It reaches an elevation of about 200 feet, 500 yards inland, and offers the most favorable conditions for air or sea landings on the island.

4. SOIL TRAFFICABILITY (FIGURE II - 83). The soils of this small, steep-sloped island are mostly stony loams derived from volcanic rock. The most favorable period for cross-country movements is during April and May. During the rest of the year there are many rainy days, and trafficability conditions are generally poor. During December, January, and February precipitation falls on more than 20 days each month. The heaviest rains occur during the period from June through September. Soil freezing probably seldom occurs, except for a few days during January and February.

(b) *Tsushima* (FIGURES II - 79 to II - 84; PLAN 17). Place names on Tsushima are in Japanese, not Korean. Tsushima is part of Japan proper.

Tsushima consists of two islands, Kamino-shima, to the north, and Shimono-shima to the south, separated by Aso-wan, a deep, island-studded bay. This bay averages 1.5 miles wide, and is closed at its eastern end, except for a narrow passageway suitable only for small craft. Together the islands are about 45 miles long and 7 miles wide. They are 35 miles from Pusan.

1. RELIEF, DRAINAGE, AND VEGETATION (FIGURES II - 79 to II - 82, and II - 84). The surface of both islands of Tsushima is almost everywhere rugged and hilly. Its coast is very irregular and mostly cliffed or rocky, but there are several small lowlands at the bay heads. The interior is a rugged, forested upland, 500 to 1,000 feet in elevation on Kamino-shima and 1,000 to 1,500 feet on Shimono-shima. Above this upland rise at least 3 prominent hills: Mi-take, about 1,600 feet, on Kamino-shima; and Shira-take, about 1,700 feet, and Yatate-yama, about 2,100 feet, on Shimono-shima. There are no extensive flat areas; only small plots are cultivated. The only sizable stretches of moderately sloping terrain are found along the southeastern side of Aso-wan. Cross-country operations would probably be difficult. The streams rise generally at elevations of 300 to 600 feet and flow in rounded but fairly steep-sided valleys, entering the heads of small bays. Two or three fairly straight stretches, about a mile long, are found in the lower reaches of the larger streams. Upland soils are mostly underlain by shale and sandstone.

2. ROUTES. The only motor road on Tsushima extends about 7 miles from Izuhara to Takeshiki, with a 2.5-mile spur toward the east (Route I-1 on FIGURE II - 79). Trails cross the

islands at intervals of about 2 miles, but none goes completely around.

3. **IMPORTANT AREAS.** The most favorable area for operations on Tsushima is the low plain southeast of Aso-wan. This area is also accessible from the anchorage at Izuhara.

4. **SOIL TRAFFICABILITY (FIGURE II-83).** Most of the topography of these islands is very rough, and trafficability depends more on slope characteristics than on soil or weather conditions. In the narrow valleys stony loams predominate, but clay loams occur in some valley lowlands. The average annual precipitation is much higher in Tsushima than in most parts of the Korean area, and soil trafficability is generally poor most of the year. It is most favorable from November through early March. Most of the precipitation during this period is in the form of rain; although snow falls on a few days each month it usually melts immediately. Trafficability conditions are especially poor from June through September.

(c) *Cheju-do* (FIGURES II-79 to II-84; PLAN 41). *Cheju-do* is oval shaped and consists largely of the 6,400-foot inactive volcano *Halla-san* (Mt. Auckland) (FIGURE II-57). The island is some 47 miles long and 20 miles wide. It is 53 miles south of Korea's southwestern tip.



FIGURE II-57. *Island Approaches. Cheju-do. App. 33°29'N, 126°35'E.* Looking across SW part of *Cheju-do* toward *Halla-san*. Gentle slopes and walled fields in the foreground. Prior to 1935.

1. **RELIEF, DRAINAGE, AND VEGETATION (FIGURES II-79 to II-82, and II-84).** The coast of *Cheju-do* is mostly rocky and cliffed, but a few small beaches occupy the heads of slight embayments (FIGURE II-58). The lower slopes (up to 2,500 feet) are mostly gentle to moderate. Above this level, slopes are steep and cliffs are common. Conspicuous features at lower elevations are the numerous small volcanic cones, which rise steeply 300 to 1,000 feet or more above the general level (FIGURE II-59). The lower slopes are cultivated or in pasture, with plots about acre size. Fields are walled (FIGURE II-57). Not much paddy rice is grown, except in the south coastal part. Small areas of grass and patches of woodland are common but scattered, and concealment is generally scant or lacking. Forests, consisting chiefly of closely spaced deciduous trees, cover the upper slopes (FIGURE II-60). Water is scarce. There are very few springs or wells, and streams are usually dry. Valley sides are steep (FIGURE II-60). Soil is dark colored

and mostly well drained. The underlying rock is blue-black in color and very compact.

2. **ROUTES.** A coastal road suitable for motor vehicles completely encircles the island (Route I-2 on FIGURE II-79). No other roads are reported suitable for vehicles, but numerous trails cross the island in all directions, though none leads up to the summit of *Halla-san*.

3. **IMPORTANT AREAS.** The towns of *Cheju* (*Saishū*) and *Mosulp'o* (*Boshippo*), and their environs, are probably the most important areas on the island. *Cheju* lies about 50 feet above sea level on gently sloping ground. The town faces upon a narrow beach about a mile long. Steep, rocky shore extends to the east and west. Two small streams, with dry upper courses, flow through the eastern and western parts of the town. Gently sloping terrain, mostly planted to crops, extends about 4 miles to the west and about 2 miles inland.

*Mosulp'o* is at the head of a small, rocky bay, on gently sloping ground some 30 to 50 feet above sea level. The shore to the southeast and northwest is mostly rocky but not steep. The surrounding country is mostly cultivated. To the east and southeast, low gently sloping terrain extends for about 2 miles across a promontory. The promontory has 200- to 250-foot cliffs on its seaward side, but grassy, mile-long beaches extend along its flanks. A mile to the north of *Mosulp'o* a conspicuous volcanic cone rises 600 feet, and about 4 miles to the northeast is a cliff-sided volcanic cone about 1,300 feet high.

4. **SOIL TRAFFICABILITY (FIGURE II-83).** Most of the soils on this island are well drained gravelly loams which generally afford good trafficability, especially in coastal areas of favorable terrain. In the south central coastal sections, there is considerable rice paddy land which is flooded and nontrafficable from June through September, but dry crops predominate in most other cultivated fields on the island (FIGURE II-57). Seasonal trafficability characteristics are similar to those of southern Korea with the best conditions occurring from October through March and least favorable conditions from June through September.

(10) **Region 10. Western Lowlands and Hills (FIGURES II-79 to II-84; PLANS 20, 25 to 34, and 48; ROUTE SUPPLEMENT FIGURES RS-11, RS-13, RS-16, RS-19, and RS-20).**

The Western Lowlands and Hills Region extends about 340 miles southeast - northwest from the tributaries of the *Yongsang* near *Mokp'o* to the hilly country east of the Lower *Amnok-kang* Valley. Its width from the Yellow Sea eastward varies from 25 to 100 miles, or about  $\frac{1}{3}$  to  $\frac{1}{2}$  the width of the peninsula. This region includes the area drained by the middle and lower courses of the rivers of western Korea. In general, the principal rivers and the hills and ridges separating their valleys are oriented northeast - southwest (FIGURE II-80). The hills and ridges extend southwestward as irregular promontories 10 to 30 miles beyond the general line of the coast, often continuing to sea as lines of islands.

(a) **Relief (FIGURES II-81, and II-82).** The terrain of this region is a succession of river basins and valleys, separated by steep or rolling hills and ridges (FIGURE II-81). Such terrain is well suited to defensive organization; each series of hills and ridges forms a natural defensive line across the path of north - south movement between basins or valleys. Each valley

Restricted

MILITARY GEOGRAPHY

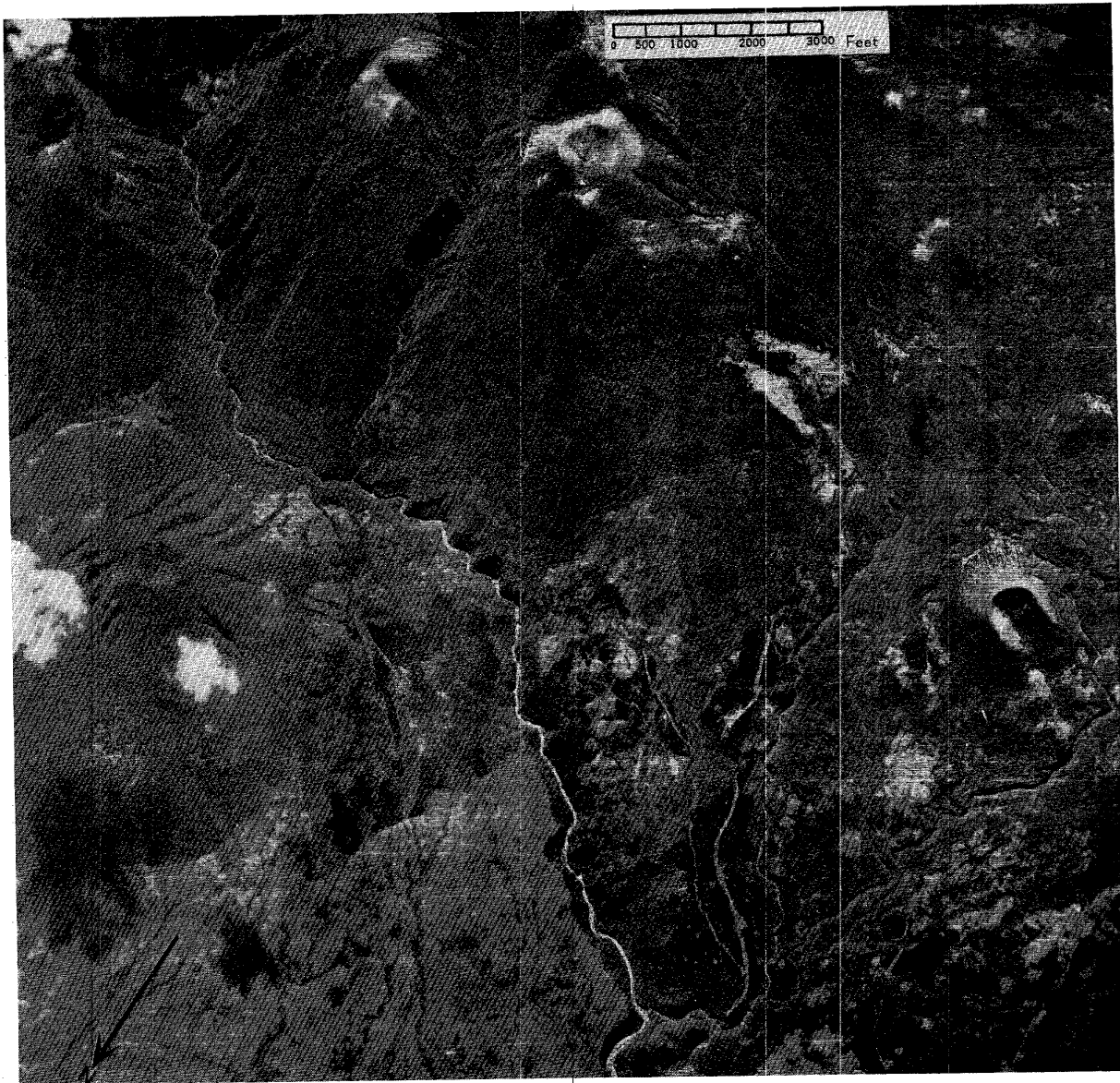
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FIGURE II - 58. *Island Approaches, Cheju-do, App. 33°29'N, 126°35'E.*  
 Air view of NE coast of Cheju-do. The coast is mostly steep and rocky. The coastal area has mostly gentle slopes and is intensively cultivated. A motor road encircles the island. October 1944.



FIGURE II - 59. *Island Approaches, Cheju-do, App. 33°29'N, 126°35'E.*  
 Gentle slopes and conspicuous subsidiary volcanic cones are characteristic of the western part of Cheju-do. Before 1935.

FIGURE II - 60. *Island Approaches, Cheju-do. App. 33°29'N, 126°35'E.*

Air view of rugged, forested, upper slopes of Halla-san. Subsidiary volcanic cones stand out, as on lower parts of island. Dry stream beds are common. Lighter areas are covered with grass. October 1944.

through the hills and ridges can be blocked at gorges and defiles. The streams are entrenched in their valleys. Relief conditions in this region, as elsewhere in Korea, bear some resemblance to those in Italy, especially in the abundance of terrain compartments, gorges, and defiles.

1. SUBREGIONS. For purposes of identification and relief description, the Western Lowlands and Hills Region has been subdivided into the following subregions from south to north:

- (a) Cholla-namdo - Cholla-pukto Hills.
- (b) Kum-gang Basin and Valley.
- (c) Ch'ungch'ong-namdo - Ch'ungch'ong-pukto Hills.
- (d) Han-gang Basin and Valleys.
- (e) Kyonggi-do Hills.
- (f) Imjin-gang and Yesong-gang Valleys.

- (g) Hwanghae-do Hills.
- (h) Taedong-gang Valley.
- (i) P'yongan-namdo Hills.
- (j) Ch'ongch'on-gang Valley.
- (k) P'yongan-pukto Hills.

a. SUBREGION 10-a: CHOLLA-NAMDO - CHOLLA-PUKTO HILLS. The Cholla-namdo - Cholla-pukto Hills extend from Hamp'yang about 50 miles northeastward to the valley of the Somjin-gang. The subregion is 5 to 10 miles wide, and separates the Yongsan-gang Valley to the south, in Region 8, from the Kum-gang Basin and Valleys to the north. It contains numerous 1,000- to 2,700-foot hills and ridges, much eroded, but lightly covered with grass, scrub pine, and scattered trees. Slopes are steep on all sides, and cliffs stand out near the

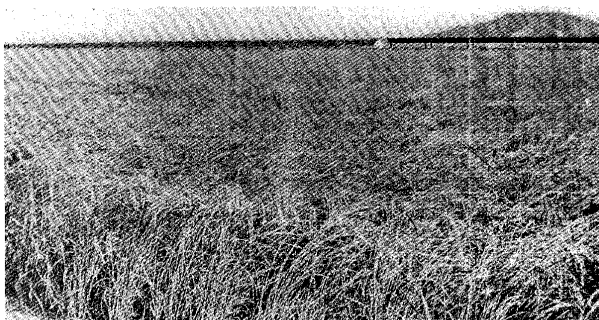


FIGURE II - 61. *Western Lowlands and Hills Region.*  
*Cholla-pukto Province.*  
Rice fields of the Tongjin Water Utilization Association.  
The rice is nearly ready for harvest. Before 1931.

higher summits. Small tributary valleys, 5 to 10 miles long and  $\frac{1}{4}$  to  $\frac{1}{2}$  mile wide, extend into the hills from the south and north, and lead up to steep, narrow passes, 500 to 1,000 feet high. Some of the valleys contain rice fields. (FIGURE II - 61) The Honam Main Line railroad and the main Kwangju - Chonju road (part of Route H-3 on FIGURE II - 79) cross these hills by adjacent routes over passes nearly 900 feet high. The Kwangju-Yongwang road (Route J-2 on FIGURE II - 79) crosses the hills over a 575-foot pass. These two are the most favorable routes through this subregion.

b. SUBREGION 10-b: KUM-GANG BASIN AND VALLEY. The basin of the lower Kum-gang extends about 30 miles north - south and about 25 miles west - east. About 4 miles of the basin lies north of the river; the rest extends southward to the vicinity of Chongup. Inland, the narrower Kum-gang Valley proper decreases in width from about 10 miles near Puyo to an average of 1 mile near Taejon. The basin consists of large sections of relatively flat flood plain, bordered by rolling hills 100 to 800 feet high. Rice paddy lands, protected by dikes, occupy much of the area. Ditches and canals cross the rice fields. Small ponds are common, and river banks are steep. Numerous small flat tributary valleys, 1 to 5 miles long and 200 to 800 yards wide, extend back into the hills. Slightly less than half the basin land is low and flat; the rest is hilly.

Near Taejon the Kum-gang Valley averages about a mile wide, and is much more winding than it is downstream. Relief features in the valley section are similar to those in the basin part of the subregion, but hills are higher (500 to 1,500 feet) and are sparsely covered with grass, brush, scrub pine, and scattered trees. Small, tributary valleys are about the same length as in the basin, but are narrower and less numerous. At several points the river flows through gorges. Existing routes turn away from the stream at these places. Flooded rice fields and heavy summer rains would hamper cross-country movement. The nearby hills command every part of the river basin and valleys (FIGURES II - 62, and II - 63). The bareness of the hills tends to exaggerate their apparent height (FIGURE II - 64). One of the main routes out of the Naktong-gang basin, the Kumch'on - Taejon - Seoul route, crosses the Kum-gang Valley (Route F-2 on FIGURE II - 79).

c. SUBREGION 10-c: CH'UNGCH'ONG-NAMDO - CH'UNGCH'ONG-PUKTO HILLS. The Ch'ungch'ong-namdo - Ch'ungch'ong-pukto Hills subregion extends from Ungch'on, near the coast, eastward to the vicinity of Mokkye on the Han-



FIGURE II - 62. *Western Lowlands and Hills Region. Konju.*  
*App. 36°25'N, 127°10'E, 20 miles NW of Taejon.*  
Lowlands are partly wooded and hills and mountains are mostly barren. 1918.

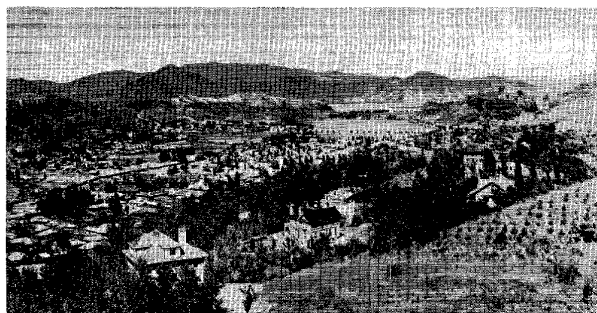


FIGURE II - 63. *Western Lowlands and Hills Region.*  
*Kongju. App. 36°28'N, 127°10'E.*  
Valley floors are flat and cultivated; hills are partly forested. 1918.



FIGURE II - 64. *Western Lowlands and Hills Region. Kumsong-san, the*  
*Castle Mountain of Naju. App. 36°13'N, 126°52'E.*  
Looking westward. The barren slopes of many Korean hills and mountains give an exaggerated effect of height. This hill is 705 feet high, but looks higher. March 1901.

gang and northward to the vicinity of Yangp'yong, also on the Han-gang. It extends about 100 miles northeast - southwest, is about 50 miles wide at the northeastern end, 30 miles wide at the southwestern end, and 15 miles wide in the middle. Elevations range from 300 to 2,700 feet and average around 1,600 feet (FIGURE II - 82). The dominant relief features are steep and much eroded hills and ridges with cliffs near the higher summits (FIGURE II - 81). Many tributary valleys extend back 2 to 5 miles into the hills. Three or four motor roads cross these hills over passes 300 to 600 feet high. The main

Taejon - Seoul - Sinuiju road and rail route follows a conspicuous passage, not higher than 330 feet, through this subregion (Route J-1 on FIGURE II - 79).

d. SUBREGION 10-d: HAN-GANG BASIN AND VALLEY. The Han-gang Basin and Valley is situated north and west of the Ch'ungch'ong Hills, and includes Seoul, one of the most important communications centers of Korea. The basin section of the subregion includes the lowlands and hills on the northern part of the Sosan Peninsula and the lowlands and hills around the bay into which the Han-gang flows. The valley section of the subregion includes the valley of the lower half of the Han-gang and its major tributaries. This whole area extends about 80 miles north - south and about 65 miles east - west. The basin section is not entirely flat, but does contain extensive

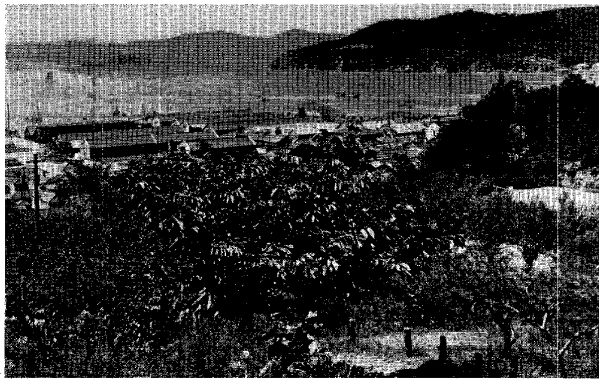


FIGURE II - 65. Western Lowlands and Hills Region. Inch'on.  
App. 37°26'N, 126°37'E.

Most west coast Korean ports, like this one, are situated at the ends of promontories. View, taken near ebb tide, when mud flats, center, are exposed. 1931.

level areas, 1 to 10 miles long and ½ to 3 miles wide, commanded by steep, eroded, 300- to 1,500-foot hills.

The Inch'on area may be considered representative of basin terrain in the Western Lowlands. It is shown on FIGURE II - 97. A hilly island, about 4 miles by 3 miles, guards Inch'on harbor. Many such islands restrict the approaches to other parts of the west coast. At low tide they are surrounded by 1 to 5 miles of slimy mud flats (FIGURE II - 65). Inch'on, like most of the chief west coast ports, is on a hilly promontory backed by rough terrain and small flat stream valleys. A little farther inland are extensive flat valleys and lowlands planted with rice. The main road and rail routes avoid these flat areas and wind through the hills. The rice fields, wet in summer, are a hindrance to cross-country operations. Terrain in the hills is not too steep for operations, but summer operation would be hindered by heavy rains. The most favorable conditions for traffic off established roads are found on winding routes over the rolling hills. Here, although there are few straight stretches, bottlenecks are rare and room for deployment is ample in most places. Each group of hills and ridges constitutes a potential defense line, however, commanding the lowlands and valleys nearby.

A representative inner lowland section, or valley area, is shown on the Seoul sheet, FIGURE II - 98. The Han-gang Valley here is of irregular width, generally from 1 to 2 miles. Level tributary valleys, 2 to 10 miles long and ½ to 1 mile wide, extend into the hill country. The hills and ridges are higher and steeper than those near the coast, and have summits of 400 to 2,700 feet; hills have steep slopes and many cliffs (FIGURE II - 66). The main road and rail routes are winding and more restricted than near the coast; there is much less terrain favorable for cross-country movement. The valleys are winding and smaller, and the hills command larger areas. Existing routes generally follow the edges of the valleys between



FIGURE II - 66. Western Lowlands and Hills Region. Seoul. 37°38'N, 127°06'E.  
Looking N. Mountains dominate all Korean lowlands. Pukak-san in left middle distance. Higher peaks beyond.

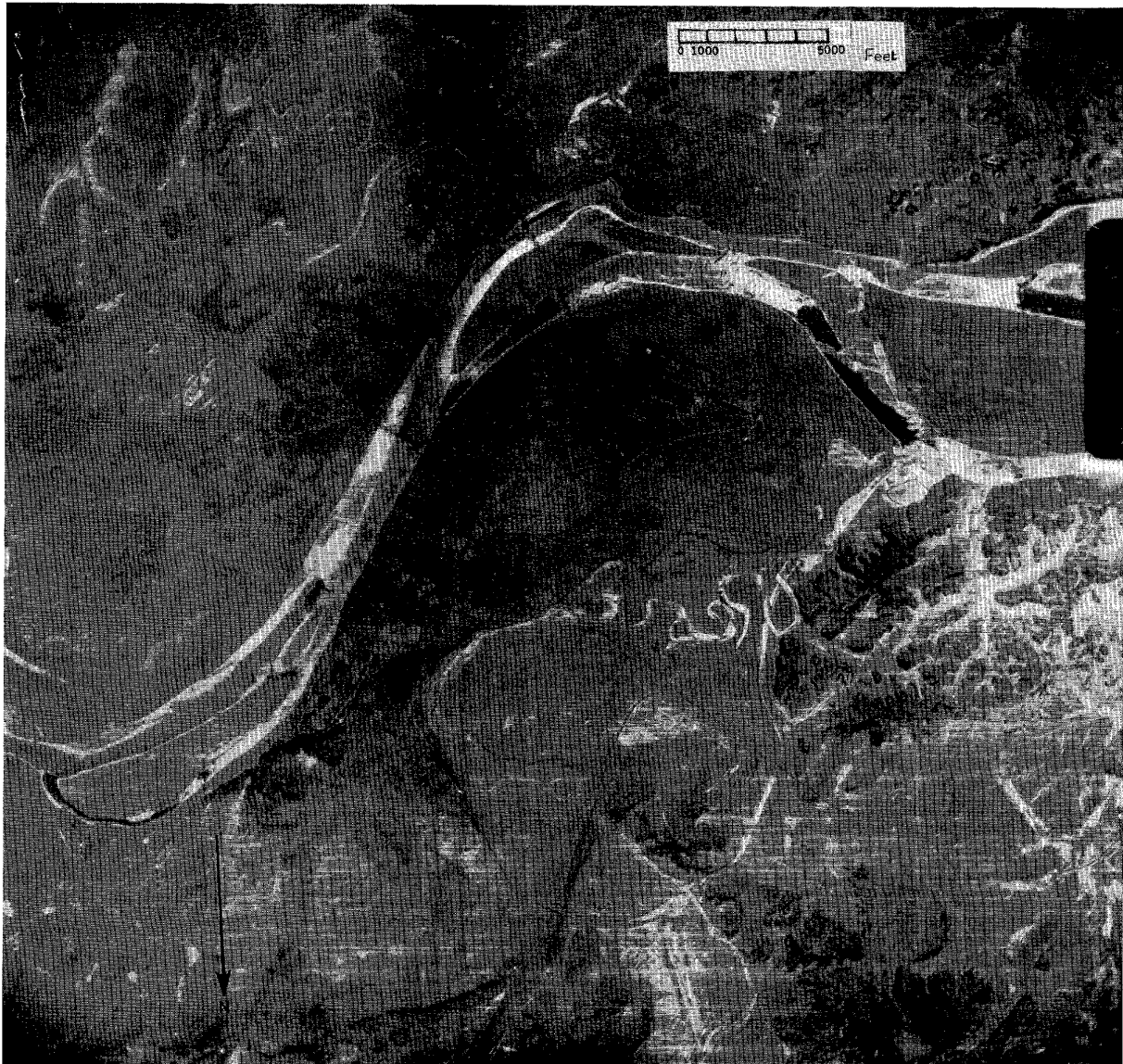


FIGURE II - 67. *Western Lowlands and Hills Region. P'yongyang, App. 39°00'N, 125°45'E.*

The winding Taedong-gang is about 400 yards wide at P'yongyang, center. Low, flat river plain is occupied by the city, crop land, and drainage features. Hills appear on both sides of the river, which flows SW past the city. December 1944.

the flat valley floors and the steep hill slopes. Passes are from 300 to 600 feet high. The Han-gang is a barrier to north - south movement throughout its course. Its current is moderate to swift; its banks are steep and generally diked; its channel is 200 to 1,000 yards wide.

Roads and railways from all directions come together at Seoul. The principal routes go south to Taejon (Route J-1 on FIGURE II - 79), southeast to Ch'ungju and Pusan (Route J-3), west to Inch'on (Route J-4), northwest to P'yongyang (Route J-1), and northeast to Wonsan (Route B-2).

e. SUBREGION 10-e: KYONGGI-DO HILLS. The Kyonggi-do Hills subregion occupies two areas, one north of the Han-gang Valley and the other between the valleys of the Imjin-gang and the Yesong-gang. These two hill areas are cut by small, flat, winding valleys, 3 to 10 miles long and

¼ to 1 mile wide, many of which have rice fields. Steep, eroded hills and ridges overlook, and in places nearly block, these valleys. The summits are 1,600 to 2,300 feet high, with numerous cliffs and little vegetation. The hills are aligned mostly northeast - southwest; the tributary valleys drain northwest or southeast. The hilly terrain does not favor military operations. Existing road and rail routes follow the edges of the valleys, avoiding the rice areas. The Seoul - P'yongyang (Route J-1) and Seoul - Wonsan (Route B-2) routes cross these hills. The most favorable terrain for cross-country movement is found in the numerous tributary valleys. These are completely dominated by hills, however, and can be blocked. Passes at their heads are 300 to 400 feet high.

f. SUBREGION 10-f: IMJIN-GANG - YESONG-GANG VALLEYS. These two winding rivers empty into the estuary of

the Han-gang. The Imjin-gang flows southwestward in a valley 1 to 8 miles wide. The Yesong-gang flows southward in a valley 1 to 15 miles wide. Both valleys vary greatly in width and provide indirect routes inland, but may be blocked in many places. The two valleys are dominated throughout by steep hills 300 to 1,600 feet high. The lower parts of these valleys have extensive flat land with rice fields, dikes, and canals. The upper parts consist of narrow alternating gorge-like defiles and flat valleys, winding among the hills. Existing road and rail routes follow the margins of the valleys near the hills. Some routes avoid the streams and lie close to the valley edge; others follow narrow benches closely parallel to the streams. Some routes also leave the valley entirely and follow passageways through the hills. The Imjin-gang and the Yesong-gang are obstacles to southeast - northwest movement. Their channels are extensively diked, are 400 to 1,000 yards wide, and may be much wider in flood.

g. SUBREGION 10-g: HWANGHAE-DO HILLS. The Hwanghae-do Hills subregion occupies most of the large area which extends westward to Changsan-got between the valleys of the Yesong-gang and of the Taedong-gang. This is the most extensive barrier in the Western Lowlands and Hills Region. The subregion is about 50 miles wide north - south and 80 miles long east - west. Hills and ridges are aligned northeast - southwest and the major stream valleys extend in roughly the same directions. The hills and ridges have elevations of 300 to 3,000 feet, averaging about 1,500 feet. Valleys are flat, 200 to 1,000 yards wide, and extremely winding. Valley sides and hill slopes are generally, but not always, steep. About one-quarter of the hill country has moderate slopes. Favorable routes for cross-country movement are mostly northeast - southwest, but movement in other directions is also possible. There are few wet-rice areas. Existing routes run near the valley margins. The Haeju - Chinnamp'o route (Route J-5 on FIGURE II - 79) crosses this region over passes about 600 feet high. West of this route the T'aet'an - Changnyon route (Route J-6) goes through Sugyo-ri, which is a western rail terminus. The highest points on this route are between 300 and 400 feet. The main Seoul - Kaesong - P'yongyang road and railroad cross the middle of this subregion with passes not higher than 230 feet (part of Route J-1). This is a very winding route but is not steep.

h. SUBREGION 10-h: TAEDONG-GANG VALLEY. The Taedong-gang Valley is north of the Hwanghae-do Hills. It includes the lower valley of the Chaeryong-gang which empties into the Taedong-gang estuary. P'yongyang is located in this subregion. The subregion extends about 80 miles northeast - southwest and averages 15 miles wide. The Chaeryong-gang section is some 25 miles long north - south, and 15 miles wide. Both valleys are flat, extremely winding, and of variable width, changing suddenly at places from 2 to 5 miles of lowland on both sides to steep slopes or cliffs closely bordering the rivers. The lower parts of the valleys are crossed by tributary streams winding through the rice fields. These lowlands are generally protected by dikes and are completely dominated by 300- to 1,000-foot hills with moderate or steep slopes. The best terrain for movement across country is  $\frac{1}{4}$  mile to 2 miles away from the streams, along the higher edges of the valleys, near the hills. Existing routes use these parts of the valleys. Terrain in the

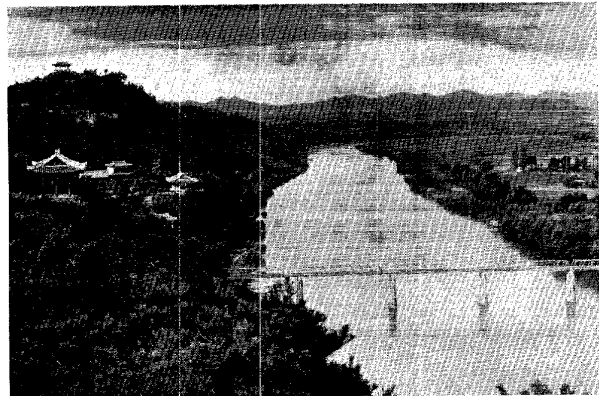


FIGURE II - 68. Western Lowlands and Hills Region. Taedong-gang Valley.  $39^{\circ}01'N$ ,  $125^{\circ}45'E$ .

Looking NNE across Taedong-gang Valley, near P'yongyang.

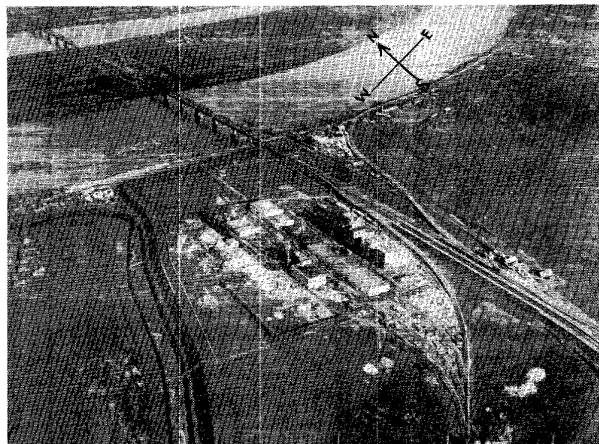


FIGURE II - 69. Western Lowlands and Hills Region. Taedong-gang Valley, 4 miles S of P'yongyang. App.  $38^{\circ}59'N$ ,  $125^{\circ}44'E$ . Looking NE. The Taedong Valley here is flat and about 10 miles wide. High bridges are needed to top spring and summer floods. High dikes partially protect lowland from floods. November 1930.

hills is not entirely suitable for cross-country movement, but numerous tributary valleys provide small, narrow passageways.

Representative surface conditions in the Taedong-gang Valley are shown on FIGURE II - 99. The Taedong-gang here winds southwestward between diked rice fields and steep, 300- to 500-foot hills (FIGURE II - 67). Small, tributary streams wind through the hills and rice fields. Dikes protect the low areas from flood waters. The entire lowland area is bordered by steep or moderately sloping hills, 300 to 1,200 feet high (FIGURE II - 68). The better routes for cross-country movement are very winding, and keep to the higher parts of the lowlands, near the hills. P'yongyang is a meeting place for routes from all directions. The Taedong is 400 to 500 yards wide at the city (FIGURE II - 69) and has a swift current. The river constitutes a considerable obstacle to north - south movement.

i. SUBREGION 10-i: P'YONGAN-NAMDO HILLS. The P'yongan-namdo Hills subregion occupies a narrow area between the Taedong-gang Valley and the Ch'ongch'on-gang Valley. It extends nearly 100 miles northeast - southwest but is only 5 to 15 miles wide. The hills and ridges have no pre-

dominant alignment but extend in all directions. The small streams emptying into the Taedong-gang or into the Ch'ongch'on-gang from these hills flow generally northwest or southeast. Near the coast the hills are low and mostly rolling. Elevations are from 300 to 1,000 feet and the lower slopes are generally moderate. The summits have steep slopes or cliffs. Very high tides occur off this coast, as elsewhere in western Korea. At low tide 1 to 5 miles of slimy mud flat may be exposed.

Near the coast, room for deployment is adequate, and numerous routes are available. A little farther inland, the hills increase in height and slopes and valley-sides become steeper; flat lowland is less common, and in many places the streams are in gorges. Still farther inland is a wilderness of 1,500- to 4,000-foot hills and mountains, having little or no terrain suitable for operations. No motor roads cross this inland area; only trails connect the few small settlements; cross-country movement by vehicles would be very difficult. The main north-south road and railroad (P'yongyang - Sinuiju, Route J-1) cross the western part of the region about 30 miles from the coast. The highest points on these routes are less than 330 feet above sea level.

j. SUBREGION 10-j: CH'ONGCH'ON-GANG VALLEY. This subregion includes the valleys of the lower Ch'ongch'on-gang and its tributaries, the lower Taeryong-gang and the lower Kuryong-gang. The lower Ch'ongch'on Valley extends about 50 miles northeast-southwest. Its lowland varies from about 3 to 20 miles in width. The valley flats are from 400 to 2,000 yards wide. They are not continuous on any one side of the stream, however, and may be restricted by steep hills coming close to the river. The valley of the Ch'ongch'on is fairly straight, but its two tributaries are extremely winding. Small side valleys, 1 to 5 miles long and 100 to 800 yards wide, provide alternate routes and limited room for deployment. All these valley areas are commanded by steep, 300- to 1,000-foot hills, partly covered with grass, scrub pine, and trees. Vehicular movement would be difficult in the hills. Terrain in the valleys favors operations except when rice fields are wet or during heavy summer rains. The main P'yongyang - Sinuiju route (Route J-1) crosses the lower valley from Anju to near Pakch'on. This road crosses both the Ch'ongch'on and the Taeryong by ferry. The streams are about 200 yards wide at the crossings. Winding roads, probably suitable for vehicles, go up the Ch'ongch'on and the tributary valleys, crossing to the Amnok-kang Valley over passes 1,600 to 2,300 feet high.

k. SUBREGION 10-k: P'YONGAN-PUKTO HILLS. The P'yongan-pukto Hills subregion includes an extensive area of hills and ridges between the Ch'ongch'on-gang Valley and the Lower Amnok-kang Valley (Region 11). The subregion extends about 80 miles east-west and 65 miles north-south. It is an extension of the western end of the Northern Korean Highlands (Region 3). The drainage of this subregion is mostly southward, however, while that of the Northern Korean Highlands is largely to the north. The relief of the subregion consists of narrow, winding gorges and valleys, overlooked by hills 500 to 3,000 feet high (FIGURES II-70, II-71). These hills and ridges have no definite alignment. The terrain is not suitable for rapid deployment off the roadways except in a belt about 8 miles wide along the coast. Main valleys could be blocked. Tributary valleys become rocky gorges upstream



FIGURE II-70. Western Lowlands and Hills Region. Pukchin. App. 40°10'N, 125°45'E.

Terrain in the most rugged part of the region, near the headwaters of the Kuryong-gang.



FIGURE II-71. Western Lowlands and Hills Region. Taeyu-dong village. 40°20'N, 125°35'E.

Looking W. Narrow partly cultivated valleys and steep partly forested hills are characteristic of the higher part of this region. Large boulders in stream bed. 1936.

and head in steep passes. Flat areas are not continuous on either side of the stream, so that it is frequently necessary to cross back and forth. Even in the less rugged area near the coast, existing routes wind to avoid the low, steep hills. Existing road and rail routes are parallel to the coast from Chongju toward Sinuiju (Route J-1) and from Chongju to Sakchu and the Amnok Valley. (Route K-1) These routes, especially the latter, could be blocked in numerous places.

2. ROUTES IN THE WESTERN LOWLANDS AND HILLS REGION. The principal Pusan-Sinuiju road routes enter the Western Lowlands near Ch'ungju (Route J-3) and near Taejon (Route J-1). These roads join at Suwon, go northward to Seoul, thence to Kaesong, P'yongyang, Anju, and Sinuiju. The main Pusan-Sinuiju rail route enters this region near Taejon. From there its route is approximately parallel to that of the road.

3. IMPORTANT AREA: SEOUL. Seoul is a meeting place for routes from all directions and is probably the center of the most important area of the Western Lowlands and Hills (FIGURE II-98).

(b) *Drainage* (FIGURE II-80). The drainage of the Western Lowlands and Hills differs greatly from that of the Eastern Coast Lowlands and Hills. The rivers are long and winding, and flow through broad alluvial valleys. They normally have slow current and most of them enter the sea through long, wide, shallow estuaries. Some of the west coast rivers have their headwaters within 15 to 25 miles of the east coast. All the streams are semi-dry water courses during the dry season (fall and winter), but become torrents after heavy rains in the wet season (summer). Most streams freeze during the winter season. They would be fordable in many places even though not frozen at this season of the year, especially in their upstream sections. Typical stream channels are generally several tens of feet below the surrounding plain, are wide and filled with sand, gravel, and boulders. There is a very great tidal rise along the west coast, and consequently the lower coastal areas, both islands and mainland, are periodically inundated. At low tide the bays empty, and are left with a shiny brown slime or mud.

On the west coast, the rice fields are laid out in regular patterns on low flats with artificial drainage. Other rice fields occupy terraces in moderately rising valleys. The paddies are surrounded by earthen embankments. The drainage and irrigation canals are more uniform in width than are natural streams, and have straighter courses. Tributary canals are from 2 to 15 feet wide and can be crossed with a minimum of difficulty. The main canals are wider and cannot be forded. Bridging might not be necessary when such canals or ditches have little or no water, but even then the bottom may be soft. Alongside the irrigation canals in the side valleys are artificial drainage gutters to carry run-off water of cloudbursts and thus keep sand and stones away from the fields. These drainage gutters are slightly above the level of the canals. The larger rivers are generally restricted by embankments in their lower courses.

There are four major drainage areas in the Western Lowlands and Hills Region, each drained by a river system or a group of rivers and separated by hill zones. The major drainage systems from south to north are (1) The Kum-gang, (2) The Han-gang, (3) The Taedong-gang, and (4) The Ch'ong-ch'on-gang.

1. **KUM-GANG.** The Kum-gang and its tributaries drain the major lowland of southwestern Korea (Subregion 10-b). From its source in the mountains which form the boundary between Kyongsang and Cholla Provinces, the course of the river describes a broad, inverted, U-shaped curve. It flows northwest through the southern part of North Ch'ungch'ong Province and continues west into South Ch'ungch'ong. Turning southwest, the river crosses the southern plains of the latter province and empties into the Yellow Sea. The river has hundreds of meanders, and almost doubles back on itself in numerous places. The area drained is one of hills to the north and east and the slopes of the Sobaek Range (Region 6) to the southeast.

The Kum-gang is about 250 miles long and within this distance it falls from a source elevation of about 1,500 feet to sea level. The main river and its tributaries drain a basin of about 3,800 square miles. In their upstream sections the streams flow through many small, basin-like valleys between the hills and ridges. In their lower courses the streams flow through low, wide, relatively flat valleys. Several of the larger

tributaries such as the Miho-ch'on, the Poch'ong-ch'on and the Namdae-ch'on, are from 20 to 30 miles long. There are also numerous smaller streams 2 to 5 miles long.

The Kum-gang channel is  $\frac{1}{2}$  to  $\frac{3}{4}$  mile wide near its mouth at Kunsan. The main river channel at this entrance has a minimum width of about 400 yards. For about 5 miles upstream from the sea the river has an average width of about 1 mile. The river then narrows slightly for about 15 miles upstream to near Kanggyong where it averages  $\frac{1}{2}$  to  $\frac{3}{4}$  mile wide. At Puyo it is 250 yards wide; near Kongju, where the road crosses, about 150 yards; and close to Sint'anjin, where the railroad crosses, the river is less than 100 yards wide. Throughout most of its upper course the Kum-gang is 75 to 100 yards wide.

In the mountainous upstream sections of the Kum-gang are numerous steep banks, 200 to 300 feet high, along the outside curves of the river. Throughout much of its course, however, the river banks are relatively low (10 to 15 feet), although there are many sections of steep banks 20 to 40 feet high. These banks are mostly sand and gravel. On the inside of curves, the banks are low and thinly covered with scattered patches of grass.

Depths vary greatly through the course of this river. During the dry season, the upper parts of the Kum-gang are fordable in many places; but during normal water level the lower Kum-gang is of sufficient depth to necessitate bridging or ferrying in numerous places. Much of the lower Kum-gang has depths of 30 to 36 feet. Within the breakwaters off the town of Kunsan are depths from 20 to 24 feet. Fifteen to twenty miles upstream the depth is about 15 feet. About 2 miles above Kanggyong depths decrease to 7 or 8 feet, but near Puyo, where the river flows in a wide curve, it is approximately 30 feet deep. River depths thence decrease upstream and near Kongju (about 1 mile above the road crossing) the river has depths of about 6 feet. Near Sint'anjin at the road and railroad crossing depths are 3 to 4 feet. Within the mountainous section, upstream from the Okch'on and Yongdong areas, the river is 3 to 5 feet deep.

The flood plain of the Kum-gang varies from 25 or 50 yards wide in the upstream mountainous section to an average of 200 to 300 yards in the lower section. In several places where the river bends, its flood plain is more than  $\frac{1}{2}$  mile wide. Within the section of the flood plain downstream from Kongju there are numerous barren sections. Elsewhere grass cover is thinly scattered. In some places cultivation extends close to the river's edge. In general, the flood plain is of sand and gravel.

The streambed is mostly sand and gravel. In the upper, mountainous, sections of the Kum-gang are many rapids, and the channel contains many large boulders. The river carries much of its sediment to its lower section where the sediment is partly deposited along the banks and curves. In this lower section the channel is divided by low, sandy islands, sometimes  $\frac{1}{4}$  to  $\frac{1}{2}$  mile long. These are flooded at high water level and are not cultivated. There are several small marsh areas near the coastal entrance, also where low tributaries join the main river.

2. **HAN-GANG SYSTEM.** The Han-gang system is larger than that of the Kum-gang, and drains an area of 12,800 square miles in and west of the Taebaek Range. The Han-gang and some of its tributaries rise within 10 to 15 miles of the east coast. The main river is joined by an equally large stream,

the Pukhan-gang, about 70 miles from the estuary. The Pukhan-gang has its source in the Southern Taebaek Range, just south of the Wonsan - Seoul Corridor. The Han-gang has its source farther southeast, in the area where the Sobaek Range joins the Southern Taebaek Range. Far downstream, at the estuary, the main river is joined by two smaller rivers, the Imjin-gang and the Yesong-gang.

The lower courses of the Han, Imjin, and Yesong cross a relatively continuous plain but their middle sections are separated by low mountains and hills. The main stream of the Han-gang is about 300 miles long and within this distance it falls almost 3,000 feet. There are many large tributaries such as the P'yongch'ang-gang, the Wonso-ch'on, and the Pukhan-gang that extend more than 60 to 80 miles into the mountains. There are hundreds of smaller streams from 10 to 20 miles long.

The estuary of the Han-gang is about 1 mile wide at the mouth of the Imjin-gang. Twenty miles upstream, at Seoul, the Han-gang is about 400 yards wide, between the railroad and road crossings of the river (FIGURE II-98). About 9 miles farther upstream, the river channel is divided by a mile-wide island. From that point upstream to the junction of the Pukhan-gang, the river has an almost constant width of 350 to 400 yards. Above the junction, the Han-gang gradually narrows, and at Yangp'yong and Yaju is about 300 yards. Near Cho-dong, at the road crossing, it is about 200 yards wide; near Tanyang, where the railroad crosses, it is about 150 yards wide.

Many of the banks of the Han-gang are high and steep, especially in the upper course, but few are cliffed. In general the banks are from 15 to 50 feet high in the mountainous sections and 10 to 20 feet high through much of its lower sections. The banks are mostly sand and gravel with boulders scattered irregularly along the upper course. Long stretches of river bluffs along the Han are barren.

Near its junction with the Imjin-gang, the Han is 18 feet deep. Boats of less than 5-foot draft can reach Seoul and those drawing 12 feet can reach about 5 miles below Seoul. There are 6- to 9-foot depths just below the railroad and road crossings at Seoul. Up to about 3 miles below the junction of the Pukhan-gang the river has a normal depth of about 12 to 15 feet. At the road crossing of Yangp'yong the depth is 21 feet; at Yaju depths are 15 feet, and at the railroad crossing near Tanyang the depth is about 15 feet. Along its entire course there are few places where it is fordable except during the winter season. The river and its tributaries carry an enormous load of debris, consequently the depths of the river channel change continuously, especially during periods of flood.

The flood plain along the Han-gang varies from less than 100 feet wide in the upper section to more than 1/2 mile wide near Seoul. It is widest on the insides of the meanders and narrows considerably where hills extend towards the banks. Though the land bordering the flood plain is cultivated, the flood plain itself is not generally under cultivation along the Han-gang. Long stretches of the flood plain are barren except for occasional small patches of grass. Most of the flood plain is sand, gravel, and rocks, with occasional boulders deposited by the floods.

The Yesong-gang and the Imjin-gang flow into and are a part of the Han-gang Estuary. The Yesong is some 110 miles long

and the Imjin has a length of approximately 160 miles. The two rivers rise in the southern slopes of the Northern Taebaek Range and flow in a general southerly direction. The Yesong-gang drains an area of about 1,500 square miles; the Imjin-gang has a slightly larger basin. Although much smaller, the alluvial valleys of these streams are similar to that of the Han-gang. Stream grades are low and each river joins the Han-gang through a small estuary of its own. Depths are great in the lower sections of the streams. Many of the barren stream banks are steep and are of sand or gravel, and of rock where low hills border the river. Alluvial flood plains border the streams and extend into the many smaller tributary valleys, especially near their confluence with the main stream.

3. TAEDONG-GANG SYSTEM. The Taedong-gang and its tributaries drain an area of approximately 7,500 square miles. The Taedong-gang rises in the Yangnim Range, flows southwest past the southern foot of Myohyang-san and is joined by the Pullyu-gang and the Nam-gang. It continues past P'yongyang, and Kyomip'o, and reaches the Yellow Sea, 20 miles downstream from Chinnamp'o. The river is about 250 miles long and falls from about 3,500 feet to sea level. Many of its tributaries are 15 to 30 miles long.

At Chinnamp'o, the Taedong-gang is about 1 mile wide. From that point downstream, the river gradually widens to its mouth. Upstream to near Kyomip'o at the junction of the Hwangju-gang, the river averages between 1/2 and 3/4 mile wide. At P'yongyang it is about 450 yards wide at the road crossing (FIGURE II-68). From P'yongyang to the coast the river channel has numerous islands (FIGURE II-67) and small sand banks, and varies greatly in width. Above P'yongyang, at the railroad crossing near Sunch'on, the river is some 200 yards wide. As it cuts through the steep slopes of Changan-san and Husonyu-bong, the river has an almost constant width of about 150 yards. The upper reach, at Tokch'on, is 150 to 200 yards in width.

In the mountainous sections of the upper Taedong-gang are many rocky cliffs 200 to 300 feet high. Most of the cliffs are on the outsides of bends. Where the river follows a straighter course, the banks are steep, but consist chiefly of gravel and sand. Many of the steep banks overhang the water's edge and crumble rather easily. Along the river's lower course, banks are 10 to 20 feet or more high, but inside banks of numerous curves are much lower. The shores of the estuary to about 10 miles above Chinnamp'o are a succession of rocky points and drying mud banks.

The estuary above Chinnamp'o is 30 to 50 feet deep. At P'yongyang, where the bridge crosses the river, normal river depth is about 18 feet. Seven or eight miles upstream, depths are 3 to 6 feet. In the next 6 or 8 miles upstream, depths are relatively shallow, but then increase to 9 to 18 feet. At Sunch'on, between the road and railroad crossing, the river is 6 to 7 feet deep. At the railroad crossing at Tokch'on the depth is about 7 feet. These depths change greatly during periods of flood.

The Taedong-gang is fordable in numerous places above P'yongyang, but not downstream from this point. During the winter season, the main river and its tributaries are frozen for 2 to 3 months. At this time depths are generally much less, many of the streams are almost dry, and sand bars and rapids within the channel are exposed. The Taedong-gang carries a

very heavy load of debris (mostly sand and gravel), part of which is deposited along its streambed. Because of the great tidal influence, the entrance to the river is free from delta deposits.

The flood plain along much of the upper Taedong-gang is relatively narrow (50 to 100 yards) or entirely lacking. Downstream from near Sunch'on is a much wider flood plain (more than  $\frac{1}{2}$  mile wide in many places) which is almost continuous to a short distance below P'yongyang. Below P'yongyang, irrigation projects are numerous and many canals extend over the plains in a dense network. The river flows between steep, wide banks in this lower section. Much of the flood plain above P'yongyang is flooded during high water.

4. CH'ONGCH'ON SYSTEM. The Ch'ongch'on is north of the Taedong-gang and separated from it by hills. The Ch'ongch'on and its tributaries rise on the southern slopes of the Northern Korean Highlands and drain a basin area of about 3,600 square miles. The streams flow in a general southwesterly direction through wide, alluvial, flat-bottomed valleys to the Yellow Sea. The main river is about 125 miles long and falls from about 3,000 feet. Its major tributary, the Kuryong-gang, is more than 70 miles long. Other streams such as the Paeksan-ch'on and the Huich'on-gang are 15 to 30 miles long.

The Ch'ongch'on is almost a mile wide at its mouth. About 5 miles upstream it narrows to about 200 yards. Near Anju, at the railroad crossing, it is 400 yards wide; where the road crosses, it is about 300 yards wide. For 6 to 8 miles above Anju the river is divided by several wide islands. Above the junction with the Kuryong-gang, there is a single channel averaging about 150 yards wide. The river has the same width at the road crossing about 3 miles above Sinhung-dong. Beyond the Huich'on-gang confluence, where the railroad crosses to follow that tributary, the main river is about 250 yards wide, but is divided by an island.

The Ch'ongch'on is shallower than the other major rivers along the west coast, and is fordable at many places along its course during normal water level. At the sharp curve about 5 miles from its mouth the river is about 10 feet deep; at the road crossing near Anju, about 6 or 7 feet deep. Below the junction of the Kuryong-gang, the river channel is braided and has a depth of about 6 feet. Upstream near Sinhung-dong, at the road crossing, it is 3 feet; where the railroad crosses near the junction of the Huich'on-gang depths are 3 to 6 feet. As the river narrows in its upper reaches the depth increases to 9 to 12 feet. Depths change greatly during periods of flood. They are lowest during the winter, when the river and its tributaries are frozen for 2 to 3 months and many of the smaller streams are dry. Sandbanks and islands are numerous in the lower downstream section, though these are usually flooded during high water.

Cliffs, generally 100 to 200 feet high, are numerous along the upper Ch'ongch'on. Below the junction of the Huich'on-gang are several stretches of cliffs more than a mile long. Along the lower section of the river to Anju, the banks are low (5 to 10 feet) and are of moderate slope. Below Anju the banks are steep, with cultivated fields extending to the river. These banks are partly mud together with sand and gravel in the lower course of the river. The height and slope of the river banks change during periods of flood. Banks are usually very low (about 5 feet) on the insides of bends.

The Ch'ongch'on flows through a wide valley, has many curves, and has a relatively wide flood plain. In its upper section where the river winds almost continuously and flows from one side of the valley to the other, the flood plain averages 100 to 200 yards. On the insides of curves the flood plain becomes much wider. Where the tributary streams join the main stream, the flood plain extends into the entrances of these smaller valleys. From the junction of the Kuryong-gang to the coast the flood plain is much wider, averaging more than  $\frac{1}{2}$  to  $\frac{3}{4}$  mile in many places. The flood plain along the lower section is mostly sand and gravel but along the upper course rocks and boulders are numerous. Most of the flood plain area is barren, although patches of grass and trees are scattered along the entire river course and on the islands, especially in the lower section of the Ch'ongch'on.

(c) *Soil trafficability* (FIGURE II-83). Much of the Western Lowlands and Hills Region area is rough or mountainous, but there are extensive lowlands or valleys where topography is favorable for cross-country movement of vehicles. Loams are the predominant soil-textural type but sandy loams, sandy clays, clay loams, and clays also occur in some areas. Narrow sandy beaches affording good trafficability at all times are numerous along the coast, but access to them is hindered at low tide by the exposure of extensive coastal flats. Where these flats are sandy, they may support light vehicles, but trafficability deteriorates rapidly with continuous passage of vehicles. Elsewhere, vehicles will mire almost everywhere on the coastal flats. Rice paddy lands predominate in the valleys south of  $38^{\circ}\text{N}$  (FIGURE II-61), and also are numerous in coastal areas north of  $38^{\circ}\text{N}$ . Many hill slopes also are terraced and planted to wet rice. The paddy fields are flooded and non-trafficable from June through September. Numerous canals, ditches, and dikes of extensive irrigation projects are permanent obstacles to movement in many areas.

In the region as a whole, nonpaddy soils are most trafficable during October and November. In the southern part of the area, trafficability conditions are only slightly less favorable from December through February, but in the northern part of the area the snow cover is usually persistent, and the rate of movement of wheeled vehicles is sometimes considerably reduced. In coastal lowlands of the north the snow cover is usually less than 18 inches, but in inland areas drifts of 3 feet are common. Soil freezing is deep and persistent enough in the north to aid trafficability wherever the snow cover is light or absent. In the southern part of the area soil freezing is usually important only during January and February and even then may be interrupted by short periods of thaw. There are few data concerning the freezing of streams and rivers, but the Taedong-gang at P'yongyang and the Han-gang at Seoul are usually frozen over by December 17 and free of ice by March 8.

During March and April, soil moisture is high as a result of melting snows and thawing soil, and soil trafficability is generally poor. Where melting snows and soil freezing are less important, as along the south coast, periods of poor trafficability accompanying the spring thaws are less severe. During May and early June trafficability is generally improved, but lowland clays and clay loams are often rendered slippery and muddy by the frequent light rains. From mid-June through September, frequent light rains result in poor soil trafficability over the medium- and fine-textured lowland soils. Heavy rains,

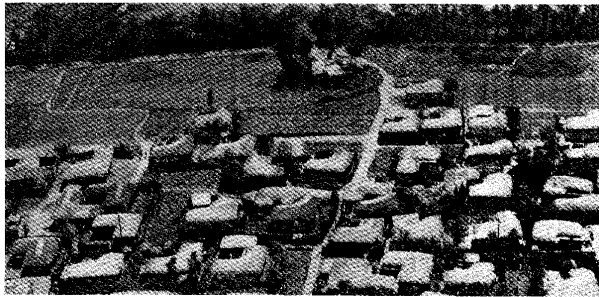


FIGURE II - 72. Western Lowlands and Hills Region. Farming village near Yongdongp'o. 37°30'N, 126°50'E.

Intensive farming is typical in the Western Lowlands. Trees border the roads and canals in many places. Before 1931.

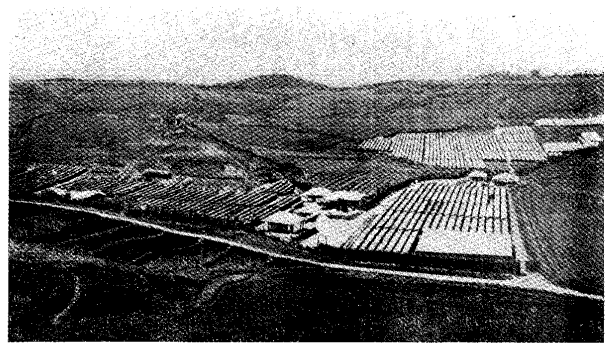


FIGURE II - 73. Western Lowlands and Hills Region. Near Kaesong. App. 37°59'N, 126°35'E.

Ginseng cultivation under shade. Before 1931.

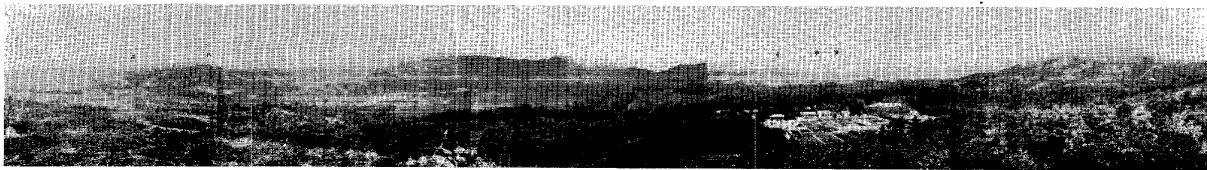


FIGURE II - 74. Western Lowlands and Hills Region. Korean forest experiment station. Hills are partly forested. Lowlands are largely cultivated, but are partly wooded. About 1933.

which occur most often during July and August, cause widespread poor trafficability.

(d) *Vegetation* (FIGURE II - 84). This region contains the largest cultivated area within the peninsula. Very little natural vegetation remains, particularly near the densely populated areas. The greatest part of the region is in crop land (FIGURE II - 72). On most of the broad alluvial valley lands, wet rice fields predominate. Dry crops are planted on intermediate slopes. Rice is also grown on terraces in parts of the region. The forests are largely in the east on the higher elevations (FIGURE II - 84). Here the hillsides are partially covered with scrub oak, pine, shrub, and grass, except where utilized for rice or dry crops (FIGURE II - 71). The region has no extensive forest areas; wooded areas are patchy, and consist largely of mixed stands of broadleaf and needleleaf trees.

Barren valleys, which are characteristic of many parts of Korea, are an important feature within this region (FIGURE II - 84). The broad valleys of the Ch'ongch'on-gang system, the Taedong-gang system, and the Han-gang system have long stretches with neither vegetation nor cultivation. This is true also of numerous tributary valley bottoms. In places, these barren valleys may extend for many miles along the rivers; in other places there are patches of trees or irregular cultivated land. Neither natural cover nor concealment is available in these barren areas. Observation is good, particularly in the less winding sections of the valleys.

Artificially watered and drained rice fields are generally uniform in size and shape and are laid out in regular patterns, in contrast to the irregular pattern of the dry-crop fields. The character of the paddy fields changes with the seasons. In April, while the fields are being prepared, the rice is planted in seed beds. Transplanting into the fields takes place about the middle of June in this region. About the middle of August the rice fields assume a yellowish-green color. Harvesting takes place



FIGURE II - 75. Western Lowlands and Hills Region. Near Hwaji, Anmyon-do (island). App. 36°30'N, 126°20'E.

Pine forest now under government supervision on Anmyon Island, off W coast of Ch'ungch'ong-namdo Province. Before 1931.

during the second half of October; at this time the fields are a brownish-yellow. The harvested rice is placed in bunches on the containing embankments to dry. If the rice crop is planted with other crops such as soybeans, the rice is dried on frames set up in the fields. During the summer, when the irrigated lowlands and valleys are flooded, cross-country movement would be difficult. Foot troops could probably move along the embankments between fields, but there would be scant concealment.

In the southern part of the region (south of 37°N), winter dry crops are planted on most of the rice fields. Commonest crops are barley and wheat, and vegetables. Summer dry-field crops include cotton and tobacco. The winter dry crops are planted in October and harvested in June.

North of about 37°N, only rice is planted in the paddy fields; dry crops, such as small grains, corn, and grain sorghum, are planted in separate fields, and are raised only in summer.

In many parts of the region, both south and north, two different crops are grown in the same field at once. Some of these fields are deeply furrowed, with one crop in the furrows and another on the low ridges between. Other important crops or vegetation types include mulberry, apples, ginseng, and bamboo.

Ginseng is a shade plant which grows wild in the Korean forests but is also cultivated in plantations. It is particularly important in the vicinity of Kaesong. Ginseng beds are sheltered from the sun and wind by reed blinds, by bowers of pine branches, or by cloth stretched above or at the side of the plots and inclining slightly to the south (FIGURE II-73). The ginseng harvest period is in August. Concealment for small groups of men would be available in ginseng fields.

Reforestation projects within the Western Coast Lowlands and Hills Regions are extensive. Some of the replanted forests are of sufficient size and density to provide considerable cover or concealment (FIGURES II-74 and II-75), but in most areas the trees are too small and the stands too open to be of great value in military operations.

(11) *Region 11. Lower Amnok-kang Valley* (FIGURES II-79 to II-84; PLANS 34 and 48; ROUTE SUPPLEMENT FIGURE RS-11).

The Lower Amnok-kang Valley Region extends from the Sup'ung reservoir, at the western edge of the Northern Korean Highlands, southwestward about 50 miles to the Yellow Sea. The width of the valley increases from 400 yards near the Sup'ung dam to 15 miles at Sinuiju, at which point the valley merges into a low, 5- to 10-mile-wide, coastal lowland (FIGURE

II-76). The river is the boundary between Korea and Manchuria. The discussion below refers only to the Korean side of the Amnok-kang Valley. The Manchurian side of the river valley is similar; it will be described in JANIS 74.

(a) *Relief.* The broad coastal plain segment of this region is relatively low and flat. Spring floods inundate large areas of the river plain below Sinuiju. Numerous islands dot the estuary of the Amnok-kang. The largest of these islands (Sin-do) is 2 to 3 miles wide. Upstream from Sinuiju, the lowland on the Korean side of the valley is narrow, flat, and winding. About 10 miles northwest of Uiju a 3-mile-long stretch of 100- to 500-foot cliffs borders the river. Together with those on the opposite bank, these cliffs form a narrow gorge.

East of the valley are 300- to 1,500-foot hills and ridges (FIGURE II-77). Many of these have rounded tops, but nearly all have steep sides and are much eroded. Numerous small side valleys, 1 to 5 miles long and 200 to 500 yards wide, extend into the hills. Terrain in these valleys is suitable for small-scale movement except in the gorges, which could be blocked easily. Alternate routes bypassing the gorges are available in most parts of the region. On the hills, relief is unfavorable for movement except along some rounded ridge tops, where movement for short distances is fairly easy.

1. *ROUTES.* The Amnok-kang is navigable for shallow-draft vessels through this entire region as far as the Sup'ung dam; when the river is frozen it can be used as a highway. For foot troops or vehicles moving along the valley this route involves several tributary and main stream crossings as well as much rugged terrain. An improved road parallels the river, but in many places this road turns away into the hills to avoid cliffs and steep slopes along the stream. The most favorable route from this region to western Korea (Route J-1 on FIGURE



FIGURE II-76. *Lower Amnok-kang Valley. Sinuiju. App. 40°07'N, 124°25'E.*  
Sinuiju is built on the low plain of the lower Amnok. Flood levees encircle the city. Much of the gravelly, bouldery stream bed is exposed. Bridges connect Sinuiju with An-tung, Manchuria. 5 February 1945.

II-79) leaves the southern part of Sinuiju, crosses the Lower Amnok Valley, and (about 22 miles from Sinuiju) goes into the low, rolling P'yongan-pukto Hills (Subregion 10k) by a pass about 330 feet above sea level. Another route (K-1) connects Chongju, in Subregion 10k, with Sakchu, near the Sup'ung reservoir. The best way into Manchuria probably is by the Sinuiju - An-tung bridges crossing the Amnok (FIGURES II-76 and II-78).

2. IMPORTANT AREAS. The Sinuiju area and the An-tung area across the Amnok in Manchuria are important to operations in this region (FIGURES II-76 and II-100). Road and rail routes come together at Sinuiju. The terrain within 3 miles of Sinuiju is suitable for vehicles except during spring

floods. Destruction of the Sup'ung dam would flood the lowlands along the lower Amnok, and would hinder operations in the region for several days.

(b) *Drainage* (FIGURE II-80). The Amnok-kang is Korea's largest river. It forms part of the boundary between Manchuria and Korea. The river drains an area of more than 24,000 square miles, about one-half of which is in Korea. The Amnok-kang rises on the southern slopes of Paektu-san at an elevation of about 6,500 feet. It flows in a general southwestward direction and empties into the Yellow Sea about 300 miles from Paektu-san, but because of its winding course the river actually flows some 500 miles. The Amnok and its numerous tributaries drain the western subregions of the Northern

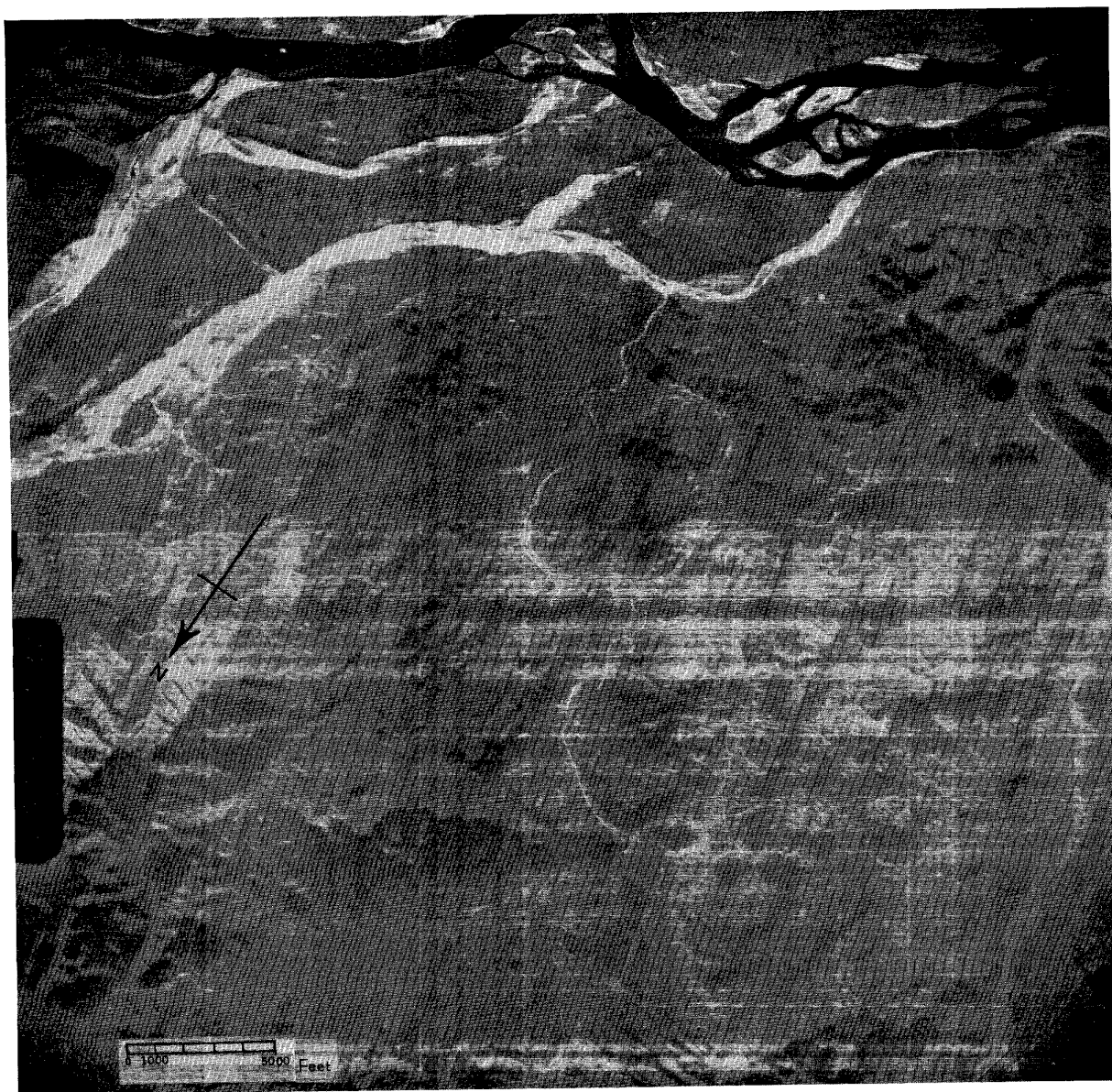


FIGURE II-77. Lower Amnok-kang Valley Region. Near Sinuiju, 40°07'N, 124°25'E. The lower Amnok-kang near Sinuiju has a winding channel and many islands. Low, much-eroded hills command the valley. The Manchurian side is shown here, terrain on the Korean side is similar. 21 December 1944.

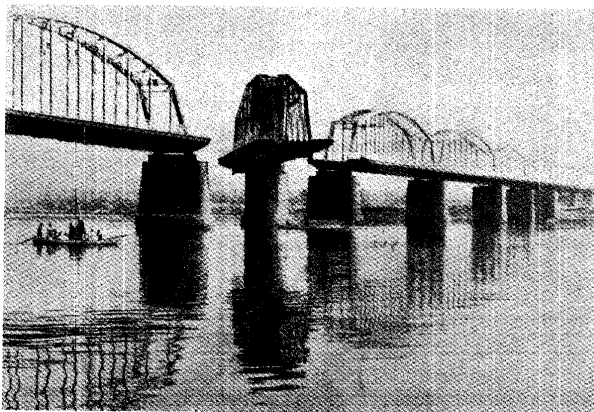


FIGURE II - 78. Lower Amnok-kang Valley Region. Sinuiju - An-tun bridge. App. 40° 10'N, 124° 25'E.

Korean Highlands. The entire Amnok-kang drainage system is entrenched in deep, winding beds. Many large tributaries, such as the Changjin-gang, Tongno-gang, and the Ch'ungman-gang on the Korean side, extend 10 to 50 miles from the main river into the Northern Korean Highlands. Numerous smaller streams, 1 to 5 miles long, drain steep, marginal highland slopes.

At the rivermouth there is an average width of 3 to 4 miles. Thirty miles upstream at Sinuiju the river is only ½ mile wide (FIGURE II - 76). Beyond Sinuiju the river channel is about 3 miles wide but is divided by several large islands (FIGURE II - 77). Farther upstream, near the Sup'ung dam, the river is only 300 to 400 yards wide. In the narrow gorges of the upper Amnok, the channel varies from 50 to 100 yards wide (FIGURE II - 24).

The Amnok has a depth of 27 feet at Sinuiju. Along the lower Amnok the river bottom is of fine sand, and the channel depths change abruptly. Here the channels are generally narrow and almost constantly shifting. Between Sinuiju and Uiju, the channel is divided by many islands, and river depths range between 9 and 18 feet. In the vicinity of the Sup'ung reservoir the depths increase to 14 feet near the mouth of the Ch'ungman-gang. Above the reservoir the river has depths ranging between 6 and 9 feet.

Banks of the lower Amnok-kang are of sand and gravel, mostly low (10 to 15 feet), and moderately steep, but at places there are bluffs more than 100 feet high. The bluffs are partly forested, border the river closely, and form narrow gorges for short distances. Farther upstream, in the Northern Korean Highlands, rocky cliffs border the river. The cliffs are higher and more numerous along the outsides of the bends (FIGURE II - 24). Banks on the inside of most curves are low and of sand and gravel (FIGURE II - 25). Uiju, about 12 miles above Sinuiju, is the upper limit of tide water. The banks in this section are mud and sand with a marshy strip marking the limits of tidal influence.

The lower Amnok has a 3- to 8-mile-wide flood plain just above Sinuiju, where the river is divided into 3 channels. This width includes the islands dividing the channels as well as the cultivated areas within the valley which are flooded each spring. The flood plain is largely of sand and gravel. Above Uiju

the flood plain is narrower, composed of rock, gravel, and sand, and interrupted by steep bluffs bordering the river.

(c) *Soil trafficability* (FIGURE II - 83). The lowland soils of this area are mostly loams, clay loams, and clays. Much of the land is planted to wet rice and is flooded and nontrafficable during late September, October, and November. Trafficability from December through February may be somewhat reduced by snow on the ground. The snow cover is usually less than a foot deep, however, and soil freezing during the same period aids trafficability where the snow is light or absent. The Amnok usually freezes over at Yongamp'o by December 9 and is free of ice by the end of February. Soil trafficability is poor during March and April, owing to high soil moisture content from melting snows and thawing soil. Trafficability of nonpaddy soils improves during May and early June, but the lowland clays are often made slippery and muddy by frequent light rains. From mid-June through mid-September, trafficability is generally poor as a result of frequent light rains and occasional periods of very heavy rain.

(d) *Vegetation* (FIGURE II - 84). A few of the higher ridges bordering the Lower Amnok-kang Valley are forested. Some of the intermediate slopes and lower hill tops are covered with scrub or grass. Cultivated fields, partly irrigated, occupy the valley floor. The valley is mostly deforested. Most of the woodlands are of secondary or tertiary growth. Mixed broadleaf and coniferous trees predominate; scrub pine, fir, oak, and birch are the principal types.

Irrigated rice is grown on the valley floor and on terraced hillsides, especially downstream from Sinuiju. Barley, buckwheat, millet, and low growing vegetables also are cultivated. There is no double cropping.

Barren areas interrupted by patches of grass are extensive along the valley floor and on hillsides upstream from Sinuiju. Many eroded gullies are almost bare.

The numerous islands within the braided river channel are either barren or covered with patches of grass and shrubs (FIGURE II - 77). Several of the larger islands are partly cultivated. Marshy areas are numerous on several of the islands, and in the lower section of the region, near the river entrance, but the marshes are small and could be bypassed.

Observation is good almost everywhere in the region except where obstructed by relief. Concealment is generally poor. Partial concealment for small groups of men is available in the scattered patches of woods. For the most part, areas surrounding settlements are cleared. In a few parts of the Lower Amnok Valley, woods or undergrowth are dense enough to retard movement in areas otherwise suitable for passage. Movement in the cultivated areas is not greatly hindered by vegetation, except when the rice fields are flooded. Most of the vegetation on the hillsides and ridgetops could furnish only limited supplies of forage or fuel, or of timber for construction purposes.

## 23. Significant Areas

Six significant areas are described below. In clockwise order, beginning in northeastern Korea, these are: (a) the Ch'ongjin Lowland; (b) the Hamhung-Wonsan Lowland, particularly near Wonsan; (c) the Wonsan - Seoul Corridor; (d) the port

of Pusan; (e) Seoul and vicinity; (f) Sinuiju and vicinity. The six areas are shown in FIGURE II - 85.

Control of most of these significant natural areas is probably essential to the success of any large-scale operations in or near Korea. The significant areas are located near natural barriers, natural passageways, or near a meeting place of natural routes.

#### A. Ch'ongjin Lowland.

(PLAN 5; FIGURE II - 87)

This lowland (FIGURE II - 8) is probably the principal gateway to the northeastern part of Korea and to Manchuria and Siberia. Ch'ongjin is situated at the eastern end of a flat lowland dominated by hills (FIGURE II - 5) and drained by a small, winding master stream, a few smaller streams, canals, and ditches. Most of the lowland is planted to rice or other crops. The principal east coast road crosses the lowland from the southwest and turns inland abruptly at Ch'ongjin, going up the eastern side of the valley. One of the principal road and rail routes to the Tuman Valley and Manchuria follows this valley. The distance from Ch'ongjin northward to Hoeryong, on the Manchurian border, is about 55 miles. From Ch'ongjin northeastward to Unggi, near the mouth of the Tuman, is about 50 miles.

#### B. Hamhung - Wonsan Lowland.

(PLANS 8, 9, 45, and 46)

This is the largest lowland on the eastern coast. It provides one of the best lodgment areas in that region (FIGURE II - 20). Wonsan (FIGURE II - 15) has one of the best harbors in Korea and is an important military and naval base. The city is on the southwestern shore of a sheltered bay, and occupies a small low area overlooked by low, partly forested hills. The main east coast road and railroad pass through Wonsan, and the most favorable east - west passageway leads southward from Wonsan to Seoul.

#### C. Wonsan - Seoul Corridor.

(PLAN 10; FIGURE II - 92)

This is the most favorable cross-peninsular route of Korea, but it does not offer easy passage. Railroad and road have different routes, each climbing to elevations greater than 2,000 feet. The northern and southern ends of each route are open and relatively favorable for operations. The middle 12 miles of the rail route are in a narrow winding gorge (FIGURE II - 92). The middle 30 miles of the road route are in an alternately open and restricted valley. The corridor is not entirely suitable for rapid, large-scale operations but provides more favorable terrain than do other routes across the peninsula.

#### D. Pusan.

(PLANS 15 and 39)

Pusan has a large, well-protected harbor, and is believed to handle more shipping than any other port in Korea. Ferries cover the 125 miles to Shimonoseki, at the western entrance to Japan's Inland Sea, in 7 or 8 hours. The harbor at Pusan opens to the southeast; it is separated into two entrances by rugged Mok-to. The city occupies a small lowland, closely backed by hills 500 to 1,600 feet high. Starting at Pusan, the main south - north road and rail routes go northward to Seoul and Sinuiju.

#### E. Seoul.

(PLANS 28 and 41; FIGURE II - 98)

Seoul is the political center and the transportation hub of Korea. Japanese political domination centers here. Primary north - south and east - west road and rail routes meet at Seoul. The city occupies most of a small lowland about 2 miles north of the Han-gang, and is dominated by steep, rugged 1,000- to 2,000-foot hills (FIGURE II - 66). The Han is 200 to 500 yards wide near Seoul and is a barrier to north - south movement.

#### F. Sinuiju.

(PLANS 34 and 48; ROUTE SUPPLEMENT FIGURE RS-11)

Sinuiju is not a deep water port, but receives much barge traffic from the ice-free port of Taedasa-do, which occupies a strategic position 20 miles to the south, near the mouth of the Amnok. Sinuiju is significant because of its situation on the Korean side of the wide Amnok-kang (FIGURE II - 76) and opposite the large Manchurian city of An-tung on the west side of the river. Although the Amnok is frozen thick enough to support troops from December through February, it is a serious barrier to movement when open. Its banks are steep, but in spring floods the river overflows, inundating the lower parts of its valley.

## 24. Routes to Significant Areas

There are three different kinds of route studies in this JANIS.

#### A. Regional routes.

Most of the practicable routes within each terrain region are described in the appropriate regional discussion in Topic 22. These local, regional routes are shown on FIGURE II - 79. Some of them are described at greater length as parts of main or alternate routes in the ROUTE SUPPLEMENT, and are so indexed on FIGURE II - 85.

#### B. Main trunk routes.

Two main routes in Korea have been selected for very detailed treatment in the ROUTE SUPPLEMENT. These main routes, shown on FIGURE II - 85, are: (1) Pusan to An-tung, Manchuria, via Seoul and P'yongyang, a distance of about 550 miles; (2) Onsong to Seoul, via the Tuman-gang and the coast to Ch'ongjin, thence to Wonsan and Seoul, approximately 560 miles; or via the Hoeryong-ch'on and Susong-ch'on valleys to Ch'ongjin, and thence to Wonsan and Seoul, some 510 miles.

The description of these main routes is largely cartographic, and consists of 76 figures (ROUTE SUPPLEMENT FIGURES RS-28 to RS-103), based on sections of the Japanese Imperial Land Survey topographic sheets, scale 1:50,000. Critical terrain features, such as rice areas, slopes between 30% and 60%, slopes over 60%, forested areas, and streams, have been accentuated in colors. Available data on roads and bridges are also shown. In addition to the very detailed treatment of the main routes, generalized movement characteristics of the country are shown on sections of the Army Map Service, Korea 1:250,000 series.

### C. Alternate trunk routes.

Important alternate routes, which have not been described on the Japanese 1:50,000 sheets, are shown on AMS 1:250,000 sheets (ROUTE SUPPLEMENT FIGURES RS-3 to RS-27). These alternate routes are described on the 1:250,000 scale maps by the same method as is used for the main routes, but the descriptions are less detailed.

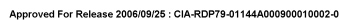
Additional route information is given in Chapters VII and XII.

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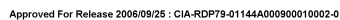
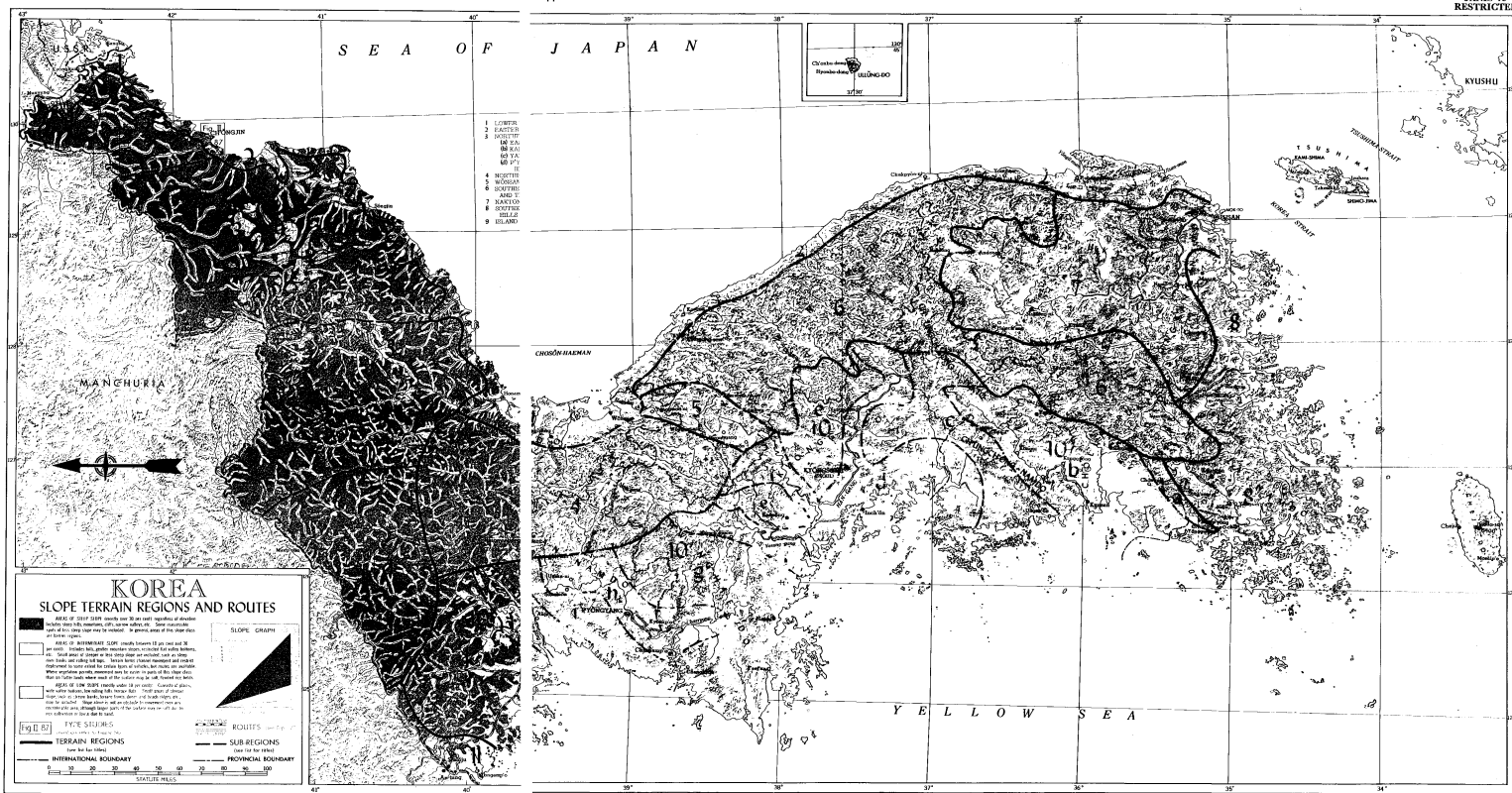
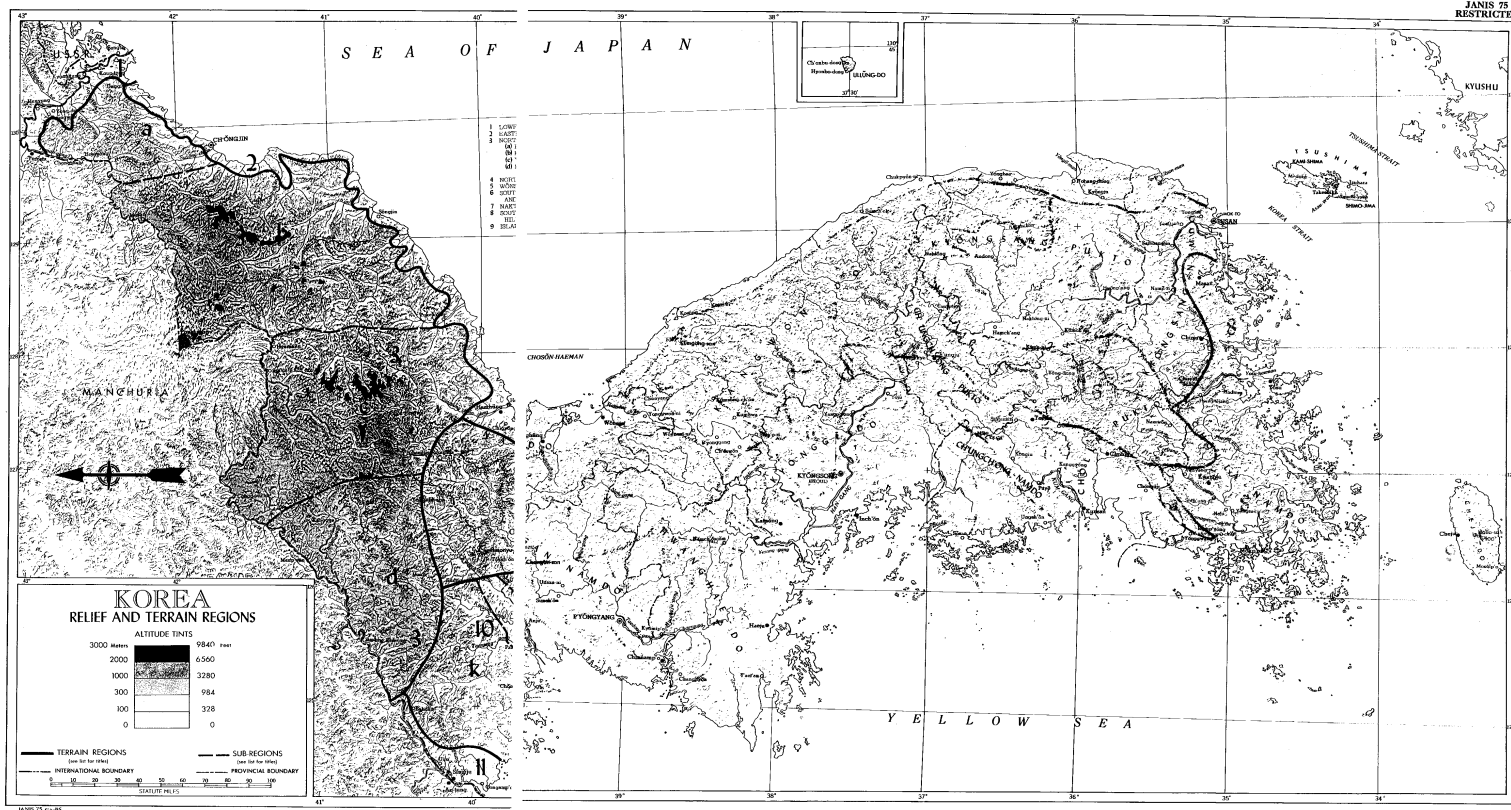
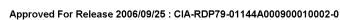
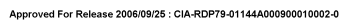


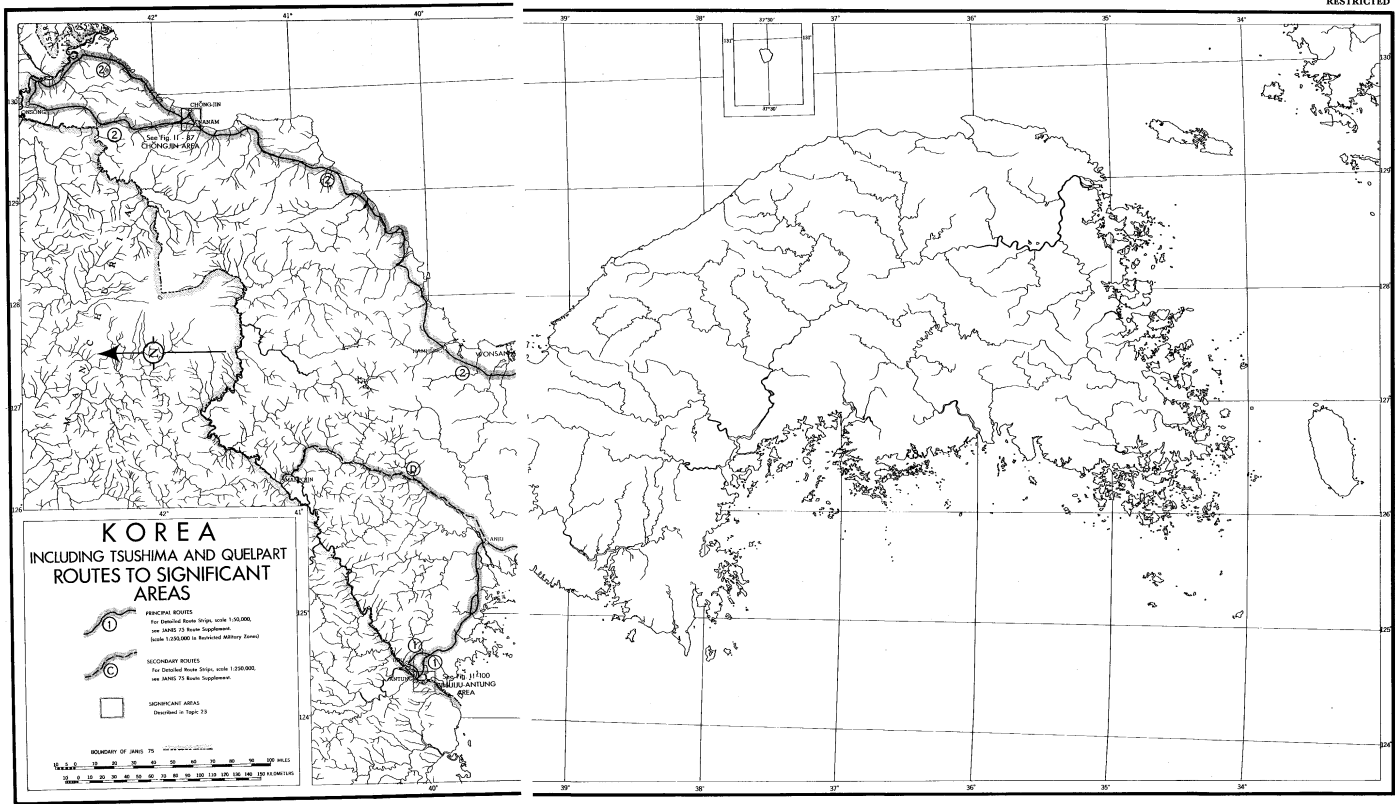
FIGURE 11-81  
SLOPE TERRAIN REGIONS AND ROUTES  
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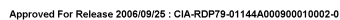












CHONGJIN  
津 清

FIGURE 11-87  
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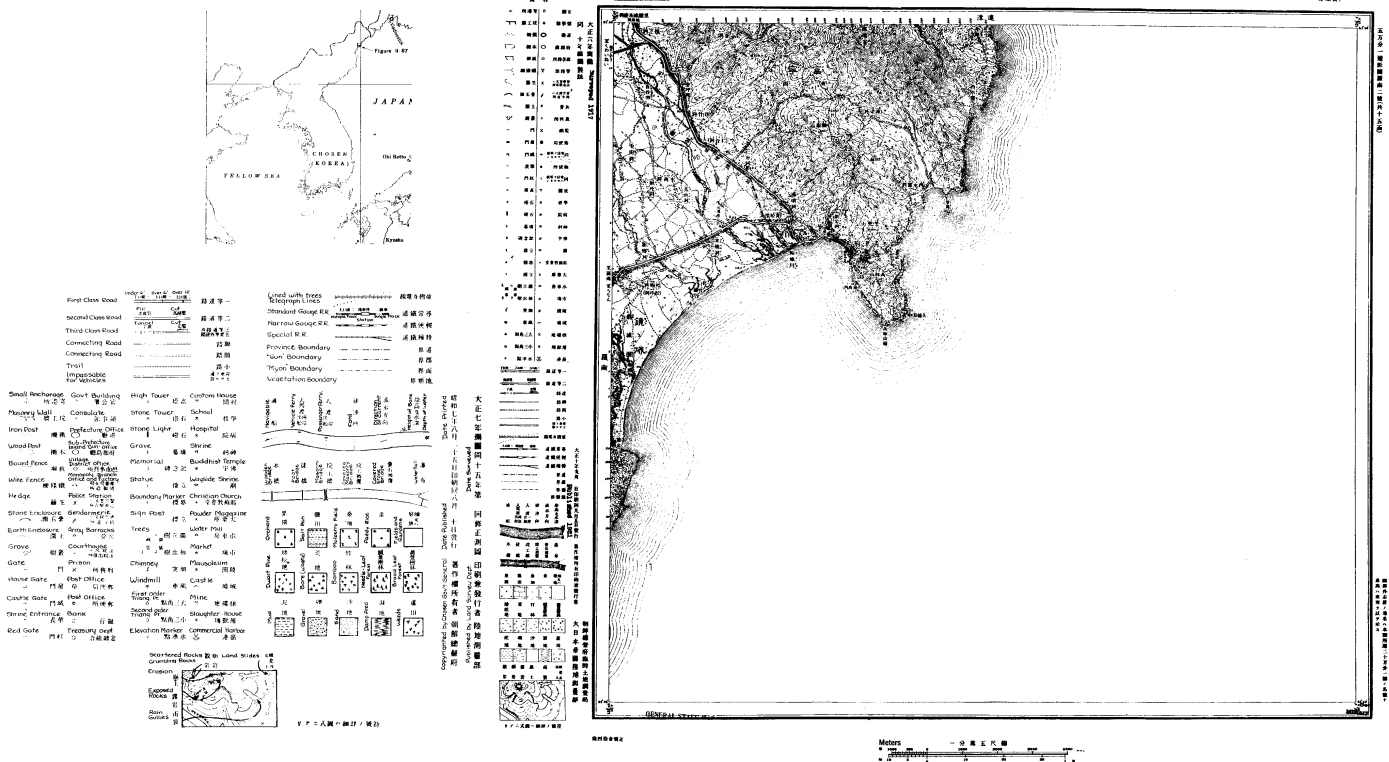


FIGURE II-88a  
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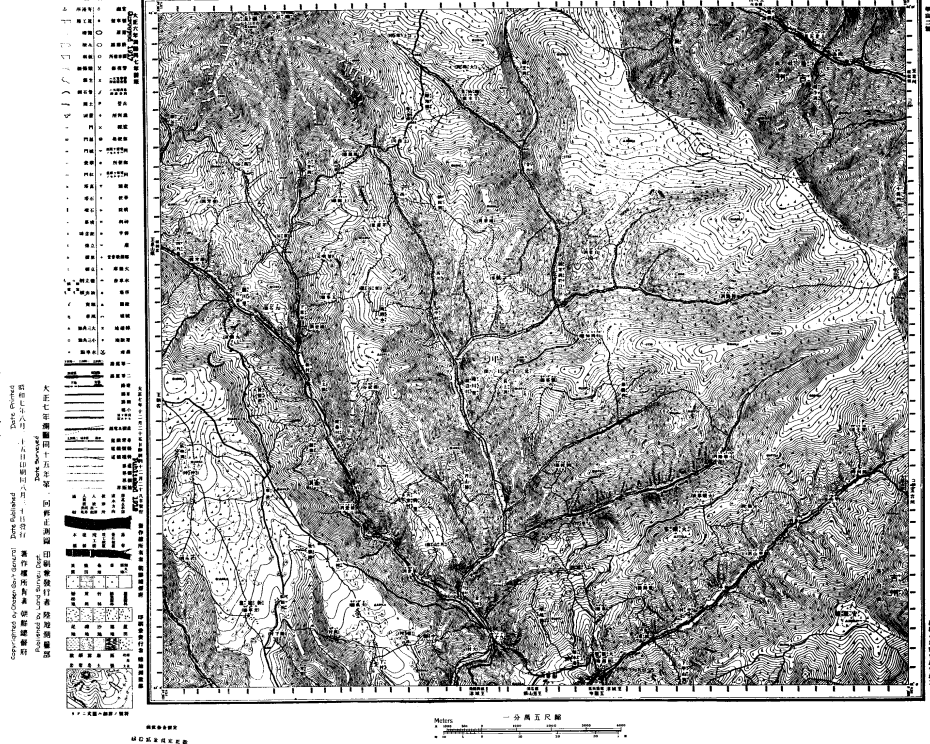
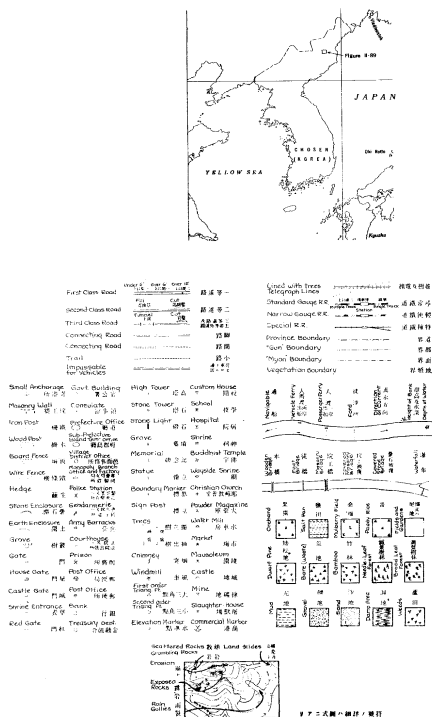


FIGURE II-68b  
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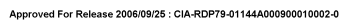
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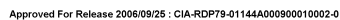
FIGURE II-89  
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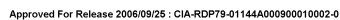












SANGJU-NI  
畢州南

FIGURE II-96a  
JANU 75  
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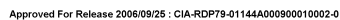
Small Airplane	Govt Building	High Tower	Custom House
Planning Unit	Consulate	Stone Tower	School
Iron Post	Refugee Office	Strong Light	Hospital
Wood Post	Sub-Station	Grove	Staircase
Board Fence	Market place	Memorial	Buddhist Temple
Wire Fence	Religious building	Statue	Landscape Temple
Hedge	Railway	Boundary Marker	Christian Church
Stone Enclosure	Bankruptcy	Sign Post	Power Magazine
Earth Enclosure	Army Barracks	Towers	Lumber mill
Grove	Courthouse	Market	Mineral
Gate	Prison	Chimney	Plastication
House Gate	Post Office	Windmill	Castle
Coping Gate	Post Office	Crucifix	Monk
Gravel Entrance	Bank	Religious building	Slaughter house
Wood Gate	Treasury	Election House	Commercial Harbor

Legend with trees  
Wangmu Lines  
Standard Gauge R.R.  
Narrow Gauge R.R.  
Special R.R.  
Province Boundary  
"Sun" Boundary  
Myon Boundary  
Vegetation boundary

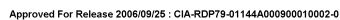
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Map of Sangju-Ni showing terrain, roads, and various landmarks.

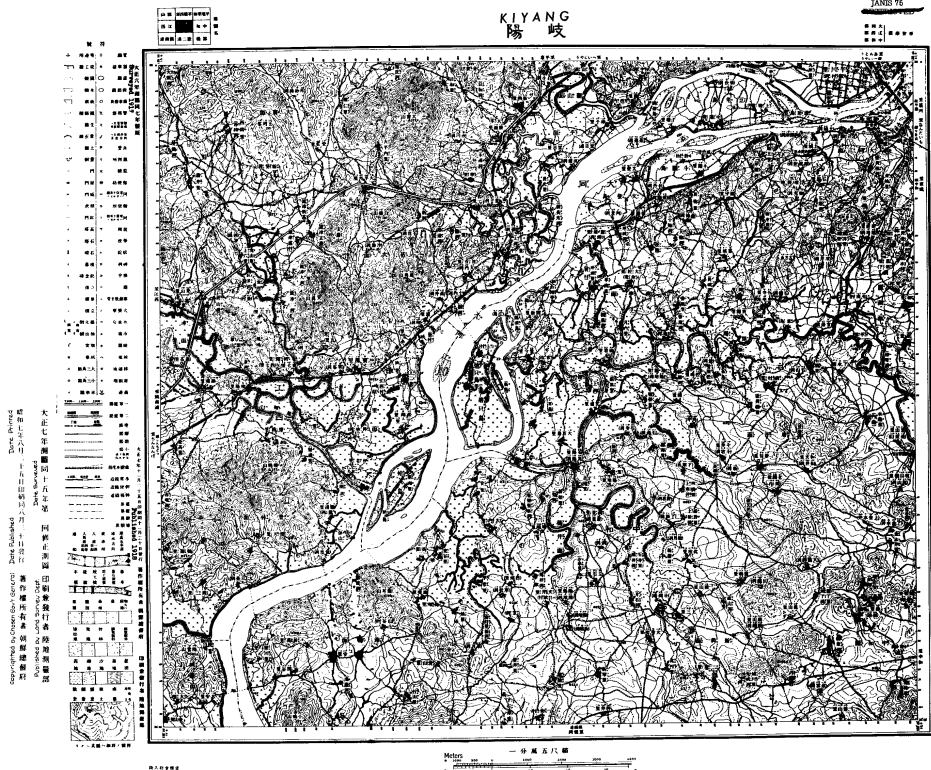


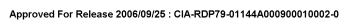












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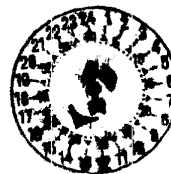
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